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PROCEEDINGS OF THE LINNEAN SOCIETY OF LONDON

153rd Session (1940-41)

Part 1

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PROCEEDINGS OF THE LINNEAN SOCIETY OF LONDON

153rd Session (1940-1)

Part 1

PROCEEDINGS OF THE SPECIAL GENERAL MEETING

7 NOVEMBER 1940

Dr. E. S. RUSSELL, O.B.E., President,
in the Chair

The Proceedings of the Anniversary Meeting held on Friday, 24 May 1940, having been circulated, were taken as read and confirmed.

The President asked the meeting to allow him to place next on the agenda the election of a Treasurer, and for the Council he put forward the name of Mr. Frederick Claude Stern.

Mr. J. RAMSBOTTOM gave the following appreciation of the services of Mr. Francis Druce, the resigning Treasurer :

As the one who has been longest associated with Mr. Francis Druce on the Council it is perhaps appropriate that I should speak of his great services to our Society.

Every Fellow who attends our Meetings knows our Treasurer for his quiet demeanour, and how he has somehow always contrived to be the least conspicuous amongst those sitting on high. He has certainly hidden his scientific attainments during our Proceedings, but botanists know of his extended journeys in the British Isles in search of rare plants, journeys, I might add, by which the National collections have greatly benefited; and his botanical library was the subject of a special article in the 'Times Literary Supplement' a short time ago [No. 1926, 31 Dec. 1938].

As Treasurer of the Society since 1931 he has looked after our financial affairs with care and skill, ever ready to explain why he proposed certain steps and always glad to answer questions put to him by members of Council, or at our Annual Meetings. Our balance sheets, year after year, are sufficient testimony to his success in keeping the finances of the Society sound when some of us perhaps were inclined to live dangerously.

“But there is something I must add, for it is not commonly known even in Council. It was not long after Mr. Druce’s election as Treasurer that his fellow officers began to appreciate the wisdom of their colleague in all matters of procedure, and to discuss points with him before bringing them before Council. Speaking for myself I should have found it far more difficult at times, and particularly during the worries of the last three years, if I had not always had my friend Druce at hand ready with sage advice. No one could have been more zealous of the dignity of The Linnean Society of London. We owe him a deep debt of gratitude not only for so skilfully managing our finances, but also for his wise counsel, and we do not forget his generosity, for he made possible the hospitality which we were able to extend to our guests at our 150th Anniversary celebrations.

A question I have been asked repeatedly during the last few days has been, “What has happened to Druce?” I think what has happened, if he were to admit it, is the fulfilment of a dream of his boyhood. The name of Druce for well over a century has been associated in the City with the Worshipful Company of Innholders, one of the City of London Guilds which are world-famous for their work and for their history. Francis Druce has been elected Master of the Innholders, a high honour indeed, for it is not lightly bestowed. We all heartily congratulate him and wish him success in his new office with the hope that the cares consequent upon the unwelcome attentions that London is receiving from above will remain merely anxieties. We thank our Treasurer for his services and we wish him well.

The ballot for the election of Treasurer was opened, and the President nominated Mr. A. D. Cotton, Dr. J. Hutchinson and Miss R. Shove as Scrutineers, instructing them to remove the balloting-glass at 3.20 P.M.

The following were thanked for gifts made to the Library since the last meeting:—Dr. G. S. Carter, Dr. J. M. Dalziel, Mr. A. J. T. Janse, Dr. E. S. Russell, Mr. W. T. Stearn, Professor F. E. Weiss and Mr. I. A. Williams.

Certificates of recommendation of the following candidates for Fellowship were read:—

For the third time and for ballot—James Insch and Colin Fraser Symington; for the second time, H. Drysdale Woodcock; and for the first time, Bryan Patrick Beirne, Rev. Leslie Walter Allam Ahrendt, James William Matthews and Angus d’Albini Bellairs.

James Insch and Colin Fraser Symington were balloted for and elected Fellows.

On behalf of Mr. J. H. OWEN, the Botanical Secretary exhibited a series of photographs of a fasciated *Cnicus lanceolatus* found at Oswestry. Fasciation of the stem extending to the terminal flower-head is by no means uncommon in this thistle. A 'hen-and-chickens' effect is added in this case by elongation of the lateral axes, so that the secondary flower-heads were carried considerably above the terminal. These were smaller and normal in shape.

The Botanical Secretary gave a brief account of the following communications :—

NANCY TYSON BURBIDGE, 'A revision of the Australian species of *Enneapogon* Desv.'. (Communicated by Sir ARTHUR HILL, K.C.M.G., F.R.S., F.L.S.) [Printed below, p. 52.]

G. C. AINSWORTH, 'Contribution towards the Fungus Flora of Uganda : IV. The *Ustilaginales* of Uganda'. (Communicated by Mr. E. W. MASON, F.L.S.) [Printed below, p. 92.]

M. ZOHARY, 'The Flora of the Desert to the south and west of Basra, Mesopotamia'. (Communicated by Mr. M. EVENARI, F.L.S.) [Printed below, p. 98.]

SIR WILLIAM WRIGHT SMITH, F.L.S., '*Primula obtusifolia* Royle'. [Printed below, p. 108.]

SIR WILLIAM WRIGHT SMITH, F.L.S., '*On Primula erratica*'. [Printed below, p. 119.]

The Zoological Secretary gave an account of the following communication : P. E. P. DERANIYAGALA, F.L.S., 'The nesting of the Leathery Turtle'. [Printed below, p. 121.]

Dr. ISABELLA GORDON gave an account of her paper entitled, 'Notes on some Indo-Pacific Crabs (Crustacea, Decapoda)'. [Printed below, p. 123.]

The Scrutineers having meanwhile reported the result of the ballot for a Treasurer, the President announced that Mr. F. C. STERN had been elected. Mr. STERN acknowledged the election.

The PRESIDENT proposed a vote of thanks to Mr. Druce for his long and devoted service as Treasurer, which was accorded by acclamation.

Mr. DRUCE in reply thanked the President and Fellows for their vote of thanks, and Mr. Ramsbottom for what he had said. It had been a pleasure for him as Treasurer to do what he could for the Society during the last ten years. Times

had not been, and were not, too easy from the financial point of view, but he believed that the position of the Society was sound, though the inevitable diminution of annual contributions owing to the war was regrettable. He wished his successor in office, Major Stern, every success.

Upon Mr. Druce putting into the President's hands his office as Vice-President, the President nominated and appointed Mr. Stern in his place.

CONTRIBUTIONS TOWARDS THE FUNGUS FLORA OF UGANDA.—III. SOME UGANDA ASCOMYCETES*.

By C. G. HANSFORD, M.A., F.L.S., Senior Plant Pathologist,
Department of Agriculture, Uganda.

THIS contribution includes the names of most of the Uganda Ascomycete fungi which have been determined with a measure of certainty; but in various families determination is extremely difficult at present, and it is more than probable that some names included here will need revision when their synonymy has been worked out more fully. The arrangement of families and genera follows that of Clements and Shear.

SACCHAROMYCETACEAE.

1. *NEMATOSPORA CORYLI* Peglion in Rend. R. Accad. d. Lincei, 7 Nov. 1897, and in Centralbl. f. Bakt. VII, p. 754 (1901). Inside seed of *Coffea arabica* and *C. robusta*, following attack by the 'Coffee Bug' (*Antestia* spp.), in most coffee areas of Uganda. The insect acts as a vector of the fungus, which causes a rot of the developing seeds; these turn dark brown to almost black during preparation of the produce for market and are worthless.

The same fungus has once been recorded causing a dry rot of orange fruit at Kampala; affected fruits dry up and become mummified before falling from the tree (*Hansford*!); nothing is known of the method of infection in this instance.

2. *NEMATOSPORA GOSSYPHII* Ashby & Nowell in Ann. Bot. XL, p. 76 (1926). Inside fruits of cultivated cotton, causing 'Internal Boll Rot', common wherever the crop is grown in Uganda; in seed of *Persea americana*, Kampala, 1927, causing a hard dry black rot (*Hansford*!); in seed of *Hibiscus cannabinus*, Kampala, *Hansford* 973; in seed of *H. esculentus*, Kampala, *Hansford* 918; in seed of *Hibiscus* spp. and of *Abutilon* spp., Kampala, 1928, *Hansford*!

* Parts I and II appeared in the Journal, Botany, vol. LI, pp. 265-84 and pp. 537-45. This part—Part III, was read in title in the meeting of 4 May 1940.

The fungus is carried by species of *Dysdercus* ('cotton stainers'); and as far as evidence is available it occurs in the seed of most of the wild Malvaceous host-plants of these insects. Its occurrence on *Persea* was not associated with visible insect damage, and remains unexplained.

ERYSIPHACEAE.

Hitherto no ascus stage of any powdery mildew has been discovered in Uganda, though in the conidial stage fungi of this group are very common.

1. *SPHAEROTHECA PANNOSA* (Wallr.) Lév. in Ann. Sci. Nat. ser. 3, xv, p. 138 (1851). On cultivated roses, Kampala, Fort Portal, Kabale, etc., very common, *Hansford*!; Kampala, *Small* 460.

2. *ERYSIPHE CICHORACEARUM* DC. in Lam., Fl. France, II, p. 274 (1805). On native tobacco, Kigezi, Ankole and Teso, *Hansford*!; hitherto not reported on varieties of commercial importance in Uganda; on leaves and inflorescences of *Mangifera indica*, Kampala and Serere, common, *Hansford*!, causing much loss of fruit on some of the better mango varieties; Kampala, *Small* 677.

3. *ERYSIPHE POLYGONI* DC. in Lam., Fl. France, II, p. 273 (1805). On *Pisum sativum* and *P. arvense*, Kigezi, *Hansford*!, almost universal in this area every year; on *Phaseolus* spp., very common everywhere, *Small* 697; *Hansford*!; on *Vicia Faba*, Kabale, 1937, *Hansford*!; on *Brassica oleracea*, Kampala and Kabale, common, *Hansford*!; on *Vigna unguiculata*, Kampala, *Small* 751; *Hansford*!

4. *UNCINULA NECATOR* (Schw.) Burr. in Ellis & Everhart, N. Amer. Pyren. p. 15 (1892). On *Vitis vinifera*, Kampala, *Small* 601; *Hansford*!

5. *OIDIUM CARICAE* Noack in Bol. Inst. Agron. S. Paulo, IX, p. 81 (1898). On *Carica Papaya*, Kampala, *Small* 624; *Hansford* 1800, common.

6. *OIDIUM HEVEAE* Steinmann, Ziekten en Plagen van *Hevea* in Nederl.-Indië, p. 90; 1925. On *Hevea brasiliensis*, wherever grown around Lake Victoria, causing much leaf-fall and preventing the setting of fruit.

7. *OIDIUM ERYSIPOIDES* Fr., Syst. Mycol. III, p. 432 (1832). On *Sesamum indicum*, Teso, 1934, and Kampala, 1936, *Hansford*!; common everywhere, but causing no visible damage.

8. *OIDIUM TINGITANINUM* Carter in *Phytopath.* v, p. 195 (1915). On *Aegle Marmelos*, Kampala, November 1936, *Hansford*!

9. *OIDIUM* spp. indet. On *Physalis peruviana*, Kampala, *Hansford*! on *Solanum* sp., Kampala, *Hansford*!; on *Tephrosia paniculata*, *Dummer* 924; on *Tropaeolum majus*, *Dummer* 1115; Kampala, common, *Hansford*!; on *Cosmos bipinnatus*, Kampala, *Small* 612; on *Bixa orellana*, Kampala, *Small* 680; common wherever the host is grown in Uganda, *Hansford*!; on *Euphorbia* spp., Kampala, *Hansford* 902, 1053; Hoima, *Hansford* 885; on *Leonotis nepetaefolia*, Kampala, common, *Hansford* 873; on *Oxalis corniculata*, Hoima, *Hansford* 889; on *Dyschoriste* sp., Hoima, *Hansford* 894; on *Phytolacca dodecandra*, Kampala, *Hansford* 1813; on *Salvia* sp., Kampala, *Hansford* 1867; on *Papaver* sp., Kabale, *Hansford* 2233; on the flowers of *Zinnia elegans*, causing shrivelling, Kampala, *Hansford*!; on *Helianthus annuus*, Kampala, *Hansford*!; on *Fagopyrum esculentum*, Kampala, 1937, *Hansford*!

PERISPORIACEAE.

1. *NEOHOEHNELIA OLIGOTRICHA* (Mont.) Thiess. & Syd. in *Ann. Myc.* xv, p. 476 (1917). Syn. *Meliola oligotricha* Mont., *Henningsomyces oligotricha* (Mont.) v. Hoehnel and *Dimeriella Olyrae* Stevens in *Trans. Illin. Acad. Sci.* x, p. 167 (1917). On *Olyra latifolia*, Kiagwe, *Hansford* 1506; on *Leersia hexandra*, Masindi, *Hansford* 1212, mentioned by the writer in 'East African Agricultural Journal', III, p. 321 (1938) as *Dimeriella* (? *Olyrae* Stev.).

(*Baker* 2105 on *Olyra latifolia* from Nicaragua is the same fungus, as deduced from the specimen in Herb. Kew).

2. *DIMERIELLA CLAVISSETA* Doidge in *Trans. Roy. Soc. S. Africa*, v, p. 717 (1917); on *Erlangea tomentosa*, Kampala, *Hansford* 1260; on *Vernonia* spp., *Dummer* 1303; Kampala, *Hansford* 1122; Entebbe Road, *Hansford* 2290; Gayaza, common, *Hansford* 2338; on *Composita*, sp. indet., Kampala, *Hansford* 747.

Examination of the specimen in the Kew Herbarium of *Dimerium Stevensii* Garman (*F. L. Stevens* 7819 on *Cordia calyptrata*, Porto Rico, det. F. L. Stevens) shows that this resembles *Dimeriella claviseta* very closely in all characters; it is also identical with *Dimerosporium cordiicola* P. Henn. (*Ule* 2950 in Herb. Kew). *D. Cordiae* P. Henn., as re-described by Sydow in *Ann. Myc.* xxiv, p. 325 (1926), is the same fungus. For the present, until it can be proved that the fungus on *Cordia* can be inoculated in composite hosts or that on

Vernonia and *Erlangea* can also infect *Cordia*, it appears best to retain them as separate species, though both belong to the genus *Dimeriella* as at present defined. These fungi are quite distinct from *D. erigeronicola* Stev. (specimen Stevens, Fungi of Brit. Guiana, no. 204, in Herb. Kew), in that the latter has simple, straight to uncinata, obtuse perithecial appendages and spores about $7 \times 2 \mu$.

3. *PARODIELLA MELIOLOIDES* (Berk. & Curt.) Wint. in Hedwigia, XXIV, pp. 108 & 257 (1885). On *Saprium Mannianum*, Dummer 159, 1117.

This fungus is associated with *Exosporium lateritium* Syd., and may be either parasitic upon it or possibly its ascus stage. Old colonies of *Exosporium* in Uganda are often parasitized by a number of different fungi.

4. *PARODIELLA PERISPORIOIDES* (Berk. & Curt.) Speg., Fung. Arg., Pug. I, p. 178 (1880). On *Crotalaria* sp., Kipayo, Dummer 1124; Bugishu, Snowden 862; Kabale, Hansford 969; on *Indigofera* sp., Namilyango, Dummer 1491; Dummer 1490, 2835; on *Vigna* sp., Kipayo, Dummer 1306; on *Tephrosia linearis*, Namanyonyi, Dummer 2749; on *Desmodium* sp., Bombo Road, Hansford 1088.

5. *PARODIELLA PERISPORIOIDES* (Berk. & Curt.) Speg., var. *MICROSPORA* Theiss. & Syd. in Ann. Myc. xv, p. 129 (1917). On *Indigofera* sp., Kampala, Hansford 1052 (leg. Liebenberg); on *Crotalaria agatiflora*, Kampala, Hansford 1363.

6. *PERISPORINA PAULLINIAE* (Stev.) Speg. in Bol. Acad. Sci. Cordoba, XXVI, p. 339 (1923). On *Irenina entebbeensis* on *Alchornea* sp., Butambala, Hansford 1369 p.p.

7. *Irene ugandensis* Hansford, sp. nov. [3201.4220.]

Plagulae epiphyllae, tenues, atrae, usque ad 3 mm. diam., vel confluentes et majores. *Mycelium* ex hyphis brunneis undulatis $6-8 \mu$ crassis septatis (articulis $30-40 \mu$ longis) opposita ramosis compositum. *Hyphopodia capitata* alternata, $24-40 \mu$ longa, cellula apicali clavato-cylindracea saepe reflexa vel curvata $18-24 \times 11-14 \mu$, cellula basali cylindracea $6-16 \mu$ longa. *Hyphopodia mucronata* opposita, ampullacea. *Setae myceliales* nullae. *Perithecia* sparsa, atra, globosa, verrucosa, $130-170 \mu$ diam., $2-6$ setis larviformibus atris reflexis conicis usque ad 20μ longis superne ornata. *Asci* bispori. *Sporae* brunneae, 4-septatae, cylindraceae, constrictae, utrinque rotundatae, $44-49 \times 17-19 \mu$.

Hab. in foliis *Fici urceolaridis*, Entebbe Road, Hansford 2411.

This species shows affinities with *I. tonkinensis* var. *Cecropiae* Stev., from which it differs in mycelial and in hyphopodial characters. It is quite distinct from *Irenina obesa* (Hansford 1409) and from *Irenina Fici* (Hansford 2117). The surface cells of the perithecia are variable, from plain conic to mammillate; some bear the appendages described above, which are transversely striate towards the tip. The branching of the mycelium is often unilateral towards the centre of the colony and the capitate hyphopodia are rather distant; the mucronate hyphopodia are formed on separate hyphae.

8. ***Irenopsis Chandleri*** Hansford, sp. nov. [3401.4220.]

Plagulae epiphyllae, tenues, atrae, usque ad 4 mm. diam., orbiculares. *Mycelium* ex hyphis atro-brunneis subrectis 6–8 μ crassis septatis (articulis 25–40 μ longis) oppositè ramosis anastomosantibus compositum. *Hyphopodia capitata* alternata vel unilateralia, 20–27 μ longa, cellula apicali late rotundata 12–17 μ diam., cellula basali cylindracea 4–8 μ longa. *Hyphopodia mucronata* sparsa, ampullacea. *Perithecia* sparsa, atra, globosa, setae verrucosa, 120–150 μ diam., setis 6–12 superne ornata; setae uncinatae, atrae, obtusae, 60–100 $\times$ 10 μ . *Sporae* atro-brunneae, cylindraceo-ellipsoideae, utrinque rotundatae, 4-septatae, constrictae, 35–43 $\times$ 12–15 μ .

Hab. in foliis *Costi afri*, Entebbe Road, Hansford 2378 (leg. P. Chandler).

9. ***Irenopsis Macarangae*** Hansford, sp. nov. [3301.4230.]

Plagulae hypophyllae, subtenues, atrae, orbiculares, usque ad 8 mm. diam. vel in confluendo majores. *Mycelium* ex hyphis sinuosis atro-brunneis 6–7 μ crassis septatis (articulis 25–45 μ longis) irregulariter ramosis reticulatis anastomosantibus compositum. *Hyphopodia capitata* diversa, saepe irregulariter lobata vel reflexa, 20–35 μ longa, cellula apicali irregulari vel lobata 11–20 μ lata et 13–20 μ longa, cellula basali cylindracea vel curvata usque ad 20 μ longa. *Perithecia* sparsa, globosa, atra, verrucosa, ad 160 μ diam., setis 3–7 superne ornata; setae brunneae, uncinatae, obtusae, usque ad 110 μ longae, membrana asperula. *Sporae* ellipsoideae, 4-septatae, atro-brunneae, leves, 42–45 $\times$ 17–20 μ , leniter constrictae.

Hab. in foliis *Macarangae Schweinfurthii*, Bukasa Rifle Range, Kiagwe, Hansford 2429.

10. ***Irenopsis masakensis*** Hansford, sp. nov. [3301.5330.]

Plagulae amphigenae, usque ad 1 mm. diam., atrae, densae, sub-crustosae. *Mycelium* ex hyphis brunneis subrectis 8–9 μ crassis septatis (articulis 12–20 μ longis) oppositè ramosis reticulatis anastomosantibus compositum. *Hyphopodia capitata* alternata, dense stipata, 20–30 μ longa, cellula apicali irregulariter radiatim lobata 13–22 $\times$ 11–20 μ , cellula basali cylindracea 5–11 $\times$ 6–9 μ . *Perithecia* in centro plagarum

aggregata, globosa, atra, 140–230 μ diam., setis 3–6 superne ornata; setae uncinatae, septatae, obtusae, 50–140 $\times$ 7–8 μ , membrana asperula. *Sporae* cylindraceae, utrinque rotundatae, atro-brunneae, 4-septatae, constrictae, 45–52 $\times$ 19–22 μ .

Hab. in foliis *Peddieae Fischeri*, Lake Nabugabo, Masaka, *Hansford 2112, 2119* (leg. P. Chandler).

The only difference noted between these two collections is that in no. 2112 the perithecia are 140–180 μ diam., while those of no. 2119 reach 230 μ . Most perithecia are situated on a subiculum of radiate hyphae (disc).

11. *Irenina Glyphaeae* Hansford, sp. nov. [3101.5330.]

Plagulae epiphyllae, usque ad 3 mm. diam., atrae, densae, orbiculares. *Mycelium* ex hyphis sinuosis brunneis septatis (articulis 20–30 μ longis) 7–9 μ crassis oppositae ramosis reticulatis compositum. *Hyphopodia capitata* alternata, 26–35 μ longa, cellula apicali irregulariter lobata 16–25 $\times$ 15–20 μ , cellula basali saepe antrorsa conoideo-cylindracea 7–17 μ longa. *Perithecia* numerosa, atra, globosa, verrucosa, 160–220 μ diam. *Sporae* cylindraceae, utrinque rotundatae, atro-brunneae, 4-septatae, constrictae, 43–51 $\times$ 17–21 μ .

Hab. in foliis *Glyphaeae greviodis*, Entebbe Road, *Hansford 2413*.

This species is strongly parasitic, causing a dark leafspot which shows through the leaf on the lower surface. In the larger colonies the perithecia are scattered, but in small colonies they are often in a central group.

12. *Irenina masakensis* Hansford, sp. nov.

Plagulae amphigenae, numerosissimae, confluentes et tunc totam fere paginam occupantes, atrae. *Mycelium* ex hyphis atro-brunneis leniter undulatis 7–8 μ crassis septatis (articulis 30–45 μ longis) oppositae ramosis reticulatis compositum. *Hyphopodia capitata* alternata, 17–29 μ longa, cellula apicali ovata vel rarius truncata vel irregulari 10–20 $\times$ 11–16 μ , cellula basali 6–8 μ longa. *Hyphopodia mucronata* opposita, ampullacea. *Perithecia* sparsa, atra, globosa, verrucosa usque ad 180 μ diam., cellulis parietis conicis. *Sporae* cylindraceae vel ellipsoideae, utrinque rotundatae, atro-brunneae, 4-septatae, constrictae, 39–44 $\times$ 17–19 μ .

Hab. in foliis *Bersamiae* sp., Lake Nabugabo, Masaka, *Hansford 2123* (Chandler 1716 p.p.).

13. *Meliola clerodendricola* P. Henn., var. *Viticis* Hansford, var. nov. [311/31.3221.]

A typo ita differt:—setae myceliales numerosae, erectae, rectae, atro-brunneae, 130–230 $\times$ 6–8 μ , apice obtusae rotundatae truncatae inflatae vel 2–3-furcatae (usque ad 15 μ).

Hab. in foliis *Viticis Cienkowskii*, Lira, *Hansford 799*.

14. *Meliola Eucleae* Hansford, sp. nov. [3113.4234.]

Plagulae plerumque hypophyllae, tenues, atrae, orbiculares, usque ad 5 mm. diam. *Mycelium* ex hyphis flexuosis 6–7 μ crassis septatis (articulis 25–40 μ longis) brunneis opposite vel unilateraliter ramosis reticulatis compositum. *Hyphopodia capitata* alternata vel opposita, 17–25 μ longa, cellula apicali clavata vel truncata saepe irregulariter curvata rarius sublobata 12–19 $\times$ 9–12 μ , cellula basali cylindracea 5–8 μ longa. *Hyphopodia mucronata* ampullacea, opposita. *Setae myceliales* 550–1250 μ longae, 8–9 μ crassae, atrae, simplices, rectae, obtusae. *Perithecia* sparsa, atra, globosa, verrucosa, 180–220 μ diam. *Sporae* atro-brunneae, 4-septatae, cylindraceae, utrinque rotundatae, constrictae, 43–49 $\times$ 15–19 μ .

Hab. in foliis *Eucleae divinorum*, Lake Nabugabo, Masaka, *Hansford 2125* (leg. P. Chandler).

The capitate hyphopodia are very variable and rather distant; mucronate hyphopodia are on separate branches and are very numerous in some colonies.

15. *MELIOLA EUOPLA* Syd. in Ann. Myc. xxvi, p. 254 (1928).
On *Tylophora* sp., Entebbe Road, *Hansford 2353*.16. *Meliola Fagarae* Hansford, sp. nov. [3133.3221.]

Plagulae tenues, atrae, epiphyllae, orbiculares, usque ad 7 mm. diam. *Mycelium* ex hyphis atro-brunneis subrectis 6 μ crassis septatis (articulis 23–40 μ longis) opposite ramosis compositum. *Hyphopodia capitata* alternata vel opposita, 12–16 μ longa, cellula apicali subglobosa vel ovata 8–12 $\times$ 7–9 μ ; cellula basali cylindracea 2–5 μ longa. *Setae myceliales* numerosae, erectae, atrae, rectae, 140–220 $\times$ 5–7 μ , 2–6-dentato-cristatae (—10 μ). *Perithecia* sparsa, atra, globosa, verrucosa, 140–170 μ diam. *Sporae* atro-brunneae, cylindraceae, utrinque rotundatae, 4-septatae, constrictae, 32–36 $\times$ 13–16 μ .

Hab. in foliis *Fagarae angolensis*, Entebbe Road, *Hansford 2414*.

17. *Meliola Motandrae* Hansford, sp. nov. [311/32.3223.]

Plagulae epiphyllae, tenues, atrae, plerumque confluentes. *Mycelium* ex hyphis brunneis subrectis 6 μ crassis septatis (articulis 12–35 μ longis) opposite ramosis compositum. *Hyphopodia capitata* plerumque opposita, rarius alternata, 11–17 μ longa, cellula apicali ovata vel subglobosa 8–12 $\times$ 7–10 μ , cellula basali cylindracea 2–5 μ longa. *Setae myceliales* atro-brunneae, erectae, rectae, usque ad 600 μ longae et basi 7–8 μ crassae, apice dentatae vel sub-acutae. *Perithecia* sparsa, atra, verrucosa, globosa, usque ad 150 μ diam. *Sporae* 4-septatae, atro-brunneae, cylindraceae, utrinque rotundatae, constrictae, 32–35 $\times$ 12–15 μ .

Hab. in foliis *Motandrae* sp., Bukasa Rifle Range, Kiagwe, *Hansford 2451*.

18. *Meliola reflexa* Hansford, sp. nov. [3121.4222.]

Plagulae amphigenae, densae, atrae, velutinae, usque ad 5 mm. diam. *Mycelium* ex hyphis atro-brunneis sinuosis 7–8 μ crassis septatis (articulis 14–30 μ longis) oppositè ramosis anastomosantibus compositum. *Hyphopodia capitata* alternata, 15–22 μ longa, cellula basali cylindracea 3–7 μ longa, cellula apicali clavata vel cylindracea 11–16 $\times$ 8–11 μ . *Setae myceliales* numerosae, 240–350 $\times$ 8–10 μ , erectae, atrae, simplices, uncinatae, apice sub-torulosa vel obtusae. *Perithecia* sparsa, globosa, atra, verrucosa, 160–180 μ diam. *Sporae* atro-brunneae, cylindraceae, utrinque rotundatae, 4-septatae, constrictae, 42–48 $\times$ 15–17 μ .

Hab. in foliis *Apocynacearum* sp. indet., Entebbe Road Forest, *Hansford 2343*.

The mycelium with its capitate hyphopodia forms almost a solid plate; the ampulliform mucronate hyphopodia are scattered, mostly in the centre of the colony; the perithecia are borne on a radiate disc. The fungus is close to *M. Fun-tumiae* var. *hamata*, from which it differs in its dense velvety colonies.

19. *Meliola sakawensis* P. Henn., var. *acutiseta* Hansford, var. nov. [3111.3222.]

A typo ita differt:—*setae myceliales* 200–480 $\times$ 7–10 μ , acutae, simplices. *Sporae* 31–38 $\times$ 12–15 μ .

Hab. in foliis *Clerodendri* sp., Entebbe Road, *Hansford 2016*; Kazi, Kampala, *Hansford 1920*. ⚡

20. *Meliola Tecleae* Hansford, nom. nov. Syn. *M. Toddaliae* Hansford (non Doidge) in Journ. Linn. Soc. Lond., Bot. LI, p. 282 (1937).

M. Toddaliae Hansford is ante-dated by *M. Toddaliae* Doidge (1916), and as the host of the type of the Uganda fungus was misdetermined as *Toddalia asiatica* instead of *Tecle nobilis*, it appears best to adopt *M. Tecleae* as the new name for *Hansford 1908*.

This differs from *M. Toddaliae* Doidge chiefly in absence of opposite capitate hyphopodia.

21. *Meliola Tecleae* Hansford, var. *Toddaliae-asiaticae* Hansford, var. nov. [3111.4233.]

A typo ita differt:—*setae myceliales* simplices non dentatae, acutae, 400–700 $\times$ 9–10 μ . *Sporae* 42–46 $\times$ 16–18 μ .

Hab. in foliis *Toddaliae asiaticae*, Entebbe Road, *Hansford 2408*.

ENGLERULACEAE.

1. *SCHIFFNERULA MIRABILIS* v. Hoehnel, Fragm. z. Mykol. no. 330 (1909). On *Adenia* sp., Entebbe Road Forests, *Hansford 1826*; on *Passiflora* sp., Entebbe Road, *Hansford 1819, 2282*.

Von Hoehnel described the spores of his species as $19-24 \times 9-12 \mu$, but Petrak (Ann. Myc. xxvi, p. 395; 1928) gives them as $20-27 \times 10-13.5 \mu$. Those of *Hansford 1826* are $16-20 \times 9-10 \mu$ and those of no. 1819 are $22-24 \times 11-12 \mu$. In the present state of our knowledge of this genus it seems preferable to include all these specimens under the one species and to withdraw the *nomina nuda* by me in 'East African Agricultural Journal', II, p. 424 (1937), namely, *S. Adeniae* Hansford and *S. Passiflorae* Hansford.

In the Uganda specimens falcate conidia, 3-septate, $30-40 \times 10-13 \mu$, with the two middle cells larger and darker than the ends, are formed on 1-2-celled conidiophores, which appear to be modified hyphopodia, lateral on the hyphae and producing single conidia on short sterigmata on the upper surface. No sarciniform conidia are present on this material.

2. *Schiffnerula Brideliae* Hansford, sp. nov.

Plagulae epiphyllae, 2-10 mm. diam., atro-brunneae, saepe confluentes, tenues, plus minusve orbiculares. *Mycelium* ex hyphis brunneis radiantibus rectiusculis $7-8 \mu$ crassis septatis (articulis $20-30 \mu$ longis) oppositae vel irregulariter ramosis compositum. *Hyphopodia* unilaterialia, continua, hemisphaerica, $7-13 \mu$ longa et $12-15 \mu$ crassa. *Perithecia* dilute olivacea, sub-globosa, $70-90 \mu$ diam.; paries parenchymaticus e strato singulo cellularum compositus, in maturitate difflorescens. *Asci* globosi, 1-3, aparaphysati, 4-8-sporei, $35-45 \mu$ diam. *Sporae* dilute brunneae, ellipsoideae, 1-septatae, leniter constrictae, $24-26 \times 12-14 \mu$.

Hab. in foliis *Brideliae micranthae*, Kampala, *Hansford 1331* (typus); Masaka Road, *Hansford 1958*; Gayaza, *Hansford 2335*.

This fungus is parasitized so often that its fructifications are rare. The common parasites are *Helminthosporium* sp., *Phaeostigma* sp., *Nematostigma clavisporum* Syd., '*Naemosphaeria*' sp. and apparently two distinct Microthyriaceous fungi. The '*Naemosphaeria*' is also a hyper-parasite on the perithecia of the *Phaeostigma*. *S. Brideliae* is the fungus described in its sterile state by Sydow as the host of *Nematostigma clavisporum* (Ann. Myc. xxxv, p. 263; 1937) on *Bridelia micrantha*, Kampala, *Hansford 1079*. As far as has been discovered this fungus does not produce conidia of any type, and no structures corresponding to the conidiophores on the Uganda specimens of *S. mirabilis* have yet been found on the mycelium.

3. *Schiffnerula Toddaliae* Hansford, sp. nov.

Plagulae epiphyllae, tenues, atrae, usque ad 3 mm. diam., saepe confluentes. *Mycelium* ex hyphis radiantibus brunneis rectis $6\ \mu$ crassis septatis (articulis $20\text{--}30\ \mu$ longis) irregulariter ramosis anastomosantibusque compositum. *Hyphopodia* continua, cylindracea vel rotundata, $9\text{--}11 \times 7\text{--}9\ \mu$. *Conidiophora* continua, unilateralia, hyphopodiis consimilia. *Conidia* falcata, olivacea, utrinque pallidiora, 3-septata, $35\text{--}40 \times 10\text{--}12\ \mu$, apice rotundata, basi breviter pedicellata. *Perithecia* generis typica, lateralialia, globosa vel sub-globosa, circa $70 \times 50\ \mu$; paries diffloescens. *Asci* globosi vel sub-globosi, $35\text{--}45 \times 30\text{--}40\ \mu$, 8-spori. *Sporae* conglobatae, brunneae, ellipsoideae, 1-septatae, constrictae, $22\text{--}25 \times 10\text{--}14\ \mu$; cellula superior crassior.

Hab. in foliis *Toddaliae asiaticae*, Entebbe Road, Hansford 1846.

This differs from *S. mirabilis* mainly in the characters of mycelium and hyphopodia, the latter being rather cylindric than hemispheric; the conidiophores are also somewhat smaller. Each perithecium contains 2–3 asci.

4. *SCHIFFNERULA* spp.

The following specimens are doubtfully distinct from *S. mirabilis*, and further collections are necessary before forming definite conclusions:—On *Whitfieldia* sp., Entebbe Road Forest, Hansford 1845; on *Vitaceae* indet., Jinja Road, Hansford 1390; on *Rhus* sp., Entebbe Road, Hansford 1841, in conidial stage only.

CAPNODIACEAE.

This family, as given by Clements and Shear, appears to the present writer to contain a very heterogeneous collection of genera, some of which, like the type genus *Capnodium*, are associated with the honey-dew excretion of leaf-inhabiting insects, while other genera contain fungi parasitic upon the host leaves. For the present, however, until it proves possible to arrange the genera in this and closely related families on a better system, the following fungi are left in the Capnodiaceae.

1. *BALLADYNA VELUTINA* (Berk. & Curt.) v. Hoehnel, *Fragm. 2 Mykol. no. 482* (1910). Syn. *Balladynopsis ugandensis* Hansford, *nomen nudum* in E. Afric. Agric. Journ. III, p. 236 (1937). On *Rubiaceae* indet., Kampala, Hansford 1386; on *Pavetta* sp., Kyotera, Oct. 1925, Maitland s.n. (Hansford 1387); on *Rubiaceae* indet., Sere, Hansford 1623; Entebbe Road, Hansford 1892; Kabale, Kigezi, Hansford 2158. (*Deighton M1033* on *Pavetta*, Sierra Leone, in Herb. Imperial Mycological Institute, Kew, also belongs to this species.)

A form with larger spores ($25-27 \times 10-12 \mu$) was collected on *Rubiaceae* sp. indet., Ankole, by J. T. Kennedy (*Hansford 2099*). *Deighton M555* on *Sarcocephalus*, Sierra Leone, is a form with spores $26-28 \times 11-13 \mu$.

The perithecia in all these specimens contain at least two asci, often three, which ripen in succession; often a perithecium contains at one time only a single ascus with its spores formed, the others being very immature.

2. *Balladyna magnifica* (Syd.) Hansford, comb. nov. Syn. *Balladynopsis magnifica* Syd. in Ann. Myc. xxxvi, p. 164 (1938). On *Canthium vulgare* (*C. golugense*), Kazi, Kampala, *Hansford 1911, 2036, 2325*; Lake Nabugabo, Masaka, *Hansford 2136* (leg. P. Chandler).

The genus *Balladynopsis* was founded by Theissen and Sydow (Ann. Myc. xv, p. 475; 1917) on *B. philippinensis* (Syd.) Theiss. & Syd., and characterized as a *Balladyna* having more than one ascus in each perithecium. Examination of *Balladyna Gardeniae* Rac., the type species of *Balladyna*, as exemplified by a specimen from Raciborski in the Kew Herbarium, shows that almost every perithecium contains two asci, one of which ripens before the other. The separation of the genus *Balladynopsis* is therefore unnecessary.

3. *Balladyna tenuis* Hansford, sp. nov. (Fig. 1.)

Plagulae amphigenae, tenues, atrae, usque ad 10 mm. diam. vel in confluendo majores. *Mycelium* ex hyphis radiantibus dilute brunneis rectis vel flexuosis $4-5 \mu$ crassis (articulis $15-25 \mu$ longis) irregulariter ramosis anastomosantibus compositum. *Hyphopodia* unilaterialia, sparsa, haud numerosa, curvulo-cylindracea, rarius sub-lobata vel furcata, $10-12 \mu$ longa et $4-6 \mu$ lata, hyphis concolorata. *Setae myceliales* numerosae, laterales erectae, atro-brunneae, sub-opacae, simplices, obtusae, $80-120 \times 5-6 \mu$, basi usque ad 10μ crassae nec rarius bulbosae, plerumque leves. *Perithecia* numerosissima, atro-brunnea vel atro-viridia, sub-globosa, stipitata, levia vel granulosa; paries e strato singulo cellularum polygonarum parenchymaticarum compositus. Perithecia $60-90 \mu$ alt. et $55-75 \mu$ diam. *Asci* $8-12$ in perithecis, elliptici, circa $50 \times 20 \mu$, sessiles, aparaphysati, fasciculati, 8-spori. *Sporae* conglobatae, olivaceo-brunneae, leves, ellipsoideae, 1-septatae, constrictae, $20-22 \times 6.5-8 \mu$; cellula superior crassior.

Hab. in foliis *Canthii vulgaris*, Entebbe Road, *Hansford 2485, 2487* (leg. P. Chandler), *2465*; in foliis *Leptactiniae* sp., Gayaza, *Hansford 2342*.

The perithecia have also a number of hyphiform 'struts' (0-5) arising from the lower half and supporting the perithecium above the leaf; the perithecial stalk consists of a

single cell which in mature perithecia becomes wide and short so that the perithecia often appear sessile; there are no true perithecial setae as in *Balladynastrum*. The colonies are much thinner than in *B. velutina* and *B. magnifica*, the hyphopodia are not darker than the mycelium, and the mycelial setae are rarely bulbous and rough.

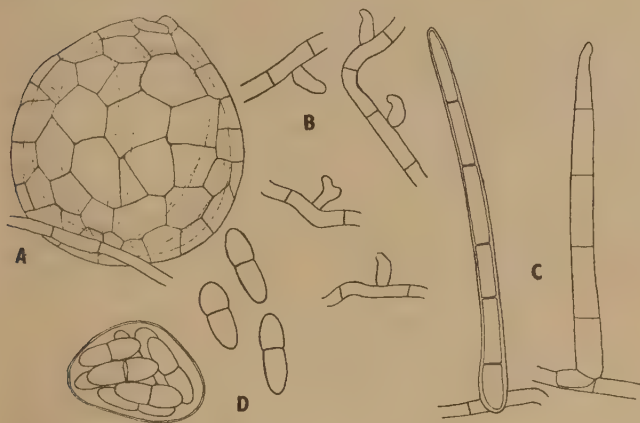


FIG. 1.—*Balladyna tenuis* (no. 2485): A, perithecium; B, hyphopodia; C, mycelial setae; D, ascus and spores. All $\times 500$.

4. *BALLADYNA UGANDENSIS* Syd. in Ann. Myc. xxxvii, p. 202 (1939). On *Rutidea odorata*, Kazi, near Kampala, Hansford 2317.

5. **BALLADYNASTRUM** Hansford, gen. nov. A *Balladyna* ita differt:—setae myceliales nullae; perithecia setulosa.

Balladynastrum entebbeensis Hansford, sp. nov. (Fig. 2.)

Plagulae amphigenae, atrae, densae, saepe crustosae, usque ad 3 mm. diam. *Mycelium* ex hyphis dilute brunneis undulatis 7μ crassis septatis (articulis $15-20\mu$ longis) unilateraliter ramosis compositum. *Hyphopodia* alternata vel unilaterialia, atro-brunnea, continua, lobata vel irregulariter rotundata, $8-10\mu$ diam., numerosa. *Perithecia* atra, subglobosa, $80-120\mu$ diam., setis $5-10$ superne ornata; setae atro-brunneae, opacae, septatae, simplices, acutae, $30-45 \times 7-8\mu$. *Asci* $3-7$, paraphysati, late ellipsoidei, 8-spори, $40-45 \times 35-40\mu$. *Sporae* conglobatae, atro-brunneae, leves, ellipsoideae, 1-septatae, constrictae, $20-23 \times 9-11\mu$.

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Hab. in foliis *Mussaendae arcuatae*, Entebbe, *Hansford 1863* (typus); in foliis *Craterispermi* sp., Entebbe Road, *Hansford 1441*; in foliis *Rubiacearum* sp. indet., Lake Nabugabo, Masaka, *Hansford 2115* (leg. P. Chandler).

The colonies of this fungus much resemble those of an *Irenina* in macroscopic appearance. The hyphopodia are much darker than the hyphae and each has a central lighter pore in the lower surface next the cuticle of the host. The fungus is strongly parasitic and causes invagination of the host leaf. The perithecia are scattered over the colony and are very numerous; each cell of the mycelium which does not bear a hyphopodium usually forms a perithecium. The perithecia are lateral on the hyphae, commencing as a single

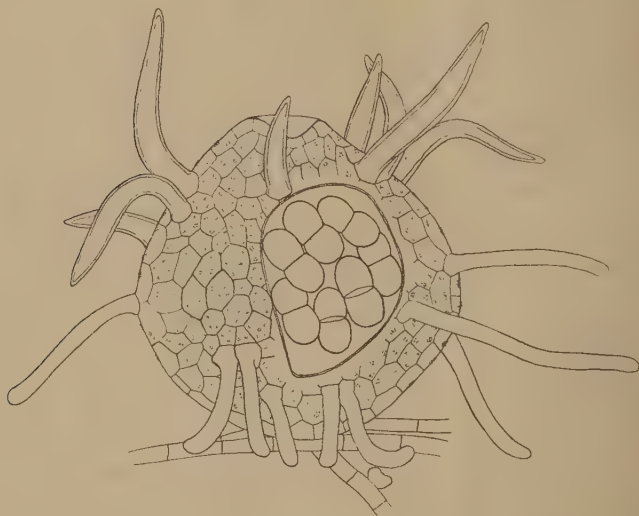


FIG. 2.—*Balladynastrum entebbeense* (no. 1863): perithecium, with asci and spores shown on the right side, $\times 500$.

large cell which segments to form a stalk cell supporting a globular mass of cells; the stalk cell persists in the ripe perithecium. The development of the perithecium follows that of the typical *Balladyna* very closely, save that when mature it bears a number of unciniate setae on the upper half and is supported above the level of the vegetative mycelium by 8–15 hyphal 'struts', outgrowths from the cells of the lower half of the perithecial wall and extending down to the leaf surface in a manner similar to those of *Balladyna Butleri* Syd. These 'struts' are usually non-septate and do not bear

hyphopodia. The asci ripen in succession as in *Balladyna* and the halves of the spores are slightly unequal.

6. *Limacinia Anacardii* Hansford, sp. nov.

Plagulae epiphyllae, tenues, effusae, atro-brunneae. *Mycelium* ex hyphis dilute brunneis $2.5-3\mu$ crassis rectiusculis irregulariter ramosis saepe parallelis indistincte septatis compositum. *Perithecia* sparsa, globosa, $200-250\mu$ diam., atro-brunnea, superficialia. *Asci* numerosi, ellipsoidei vel late clavati, aparaphysati, circa $90-30\mu$. *Sporae* cylindraceo-fusoideae, hyalinae, 3-septatae, leniter constrictae, leves, subrectae, utrinque rotundatae, $35-50 \times 7-9.5\mu$. Hyphopodia et setae nullae.

Hab. in foliis *Anacardii occidentalis*, Kampala, Hansford 1365.

The whole fungus is superficial on the leaves and apparently not parasitic. The perithecia are thin-walled and smooth; no setae present, and no conidial stage found. The asci contain eight spores more or less parallel.

TRICHOthyriaceae.

1. *Actinopeltis Funtumiae* Hansford, sp. nov.

Thyrothecia epiphylla, superficialia, discoidea, circa 300μ diam. et 250μ alt., atro-brunnea; porus in centro thyrothecii leniter papillatus; setae $25-50$, atro-brunneae, septatae, $300-400 \times 8\mu$, apice subacutae, rectae, simplices. *Asci* numerosi, aparaphysati, 8-sporei. *Sporae* parallelae, cylindraceae, utrinque rotundatae, hyalinae, leves, circa 30-septatae, leniter constrictae, $110-140 \times 15-17\mu$.

Hab. in foliis *Funtumiae elasticae*, Butambala, Hansford 1419.

The perithecial setae are arranged around the upper edge of the disc-like thyrothecium and the asci hang down from the upper surface of the cavity. The fungus has no free mycelium.

Coryneliaceae.

1. *CORYNELIA CLAVATA* (Linn.) Sacc., forma *MACROSPORA* Syd., in Deutsch. Zentr.-Afr. Exped. II, p. 100 (1910). On *Podocarpus milanjanus*, Butagu, Ruwenzori, 10,000 ft., *Mildbraed* 2547.

Fitzpatrick has raised this to specific rank as *C. bispora*, in *Mycologia*, XII, p. 242 (1920).

2. *CORYNELIA UBERATA* Fr., Syst. Myc. II, p. 535. On *Podocarpus milanjanus*, Entebbe, Maitland 228 (det. Kew); on *Podocarpus gracilior*, Kigezi, Eggeling 3249 (Hansford 2420).

SPHAERIACEAE.

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1. ENCHNOA CHAETOMIODES Penz. & Sacc. in Malpighia, XI, p. 390 (1897). On dead wood, Masaka Road Forest, *Hansford 2075* (det. Imp. Myc. Inst. Kew).

2. CĀLOSPHAERIA SCABRISETA (Schw.) Sacc., Syll. Fung. I, p. 100 (1882). On dead bark, Kampala, *Small 312* (det. Kew).

3. EUTYPELLA CORYNESTOMA (Berk. & Rav.) Sacc., Sylloge I, p. 156. On dead branch of *Albizzia moluccana*, Kampala, *Maitland 199* (det. Kew).

4. EUTYPELLA HEVEAE Yates in Philipp. Journ. Sci., Bot. XIII, p. 378 (1918). Saprophyte on branches of *Hevea brasiliensis*, Kampala, *Snowden 673, 674*.

5. PHYSALOSPORA CLERODENDRI Syd. in De Wildeman, Fl. Bas. set Moy. Congo, ser. 3, I, extr. p. 14 (1909). On leaves of *Clerodendron* sp., Entebbe Road, *Hansford 1844*; Masaka Road, *Hansford 1959 p.p.*

6. PHYSALOSPORA FUSCA N. E. Stevens in Mycologia, XVIII, p. 210 (1926). On dead branches of *Tephrosia Vogelii*, Kampala, *Hansford 2108*.

7. CERATOSTOMELLA PARADOXA Dade in Trans. Brit. Myc. Soc. XIII, p. 91 (1928). In its conidial stage (*Thielaviopsis*) on fruits of banana, causing a 'finger-tip rot', Bugishu, *Hansford!* (leg. Snowden); on cuttings of sugar-cane, Lugazi, Oct. 1937, *Hansford!*

8. TRICHOSPHAERIA ACANTHOSTROMA (Mont.) Sacc., Sylloge, I, p. 454. On dead wood, Masaka Road, *Hansford 2072*.

This material shows a very close resemblance to *Teratonema corniculariiforme* (P. Henn.) Syd. as described in Ann. Myc. XXI, p. 336 (1923).

9. TRICHOSPHAERIA BAMBUSINA v. Hoehnel in Sitzb. k. Akad. Wien, cxviii, i, p. 336 (1909). On dead haulm of *Pennisetum purpureum*, Kampala, *Hansford 1116*.

10. GLOMERELLA CINGULATA (Stonem.) Spauld. & v. Schrenk in Science, N.S. xvii, p. 750 (1903). On *Coffea arabica*, *C. robusta*, *C. liberica*, *Theobroma Cacao*, seedlings of *Gossypium* sp., *Phaseolus vulgaris*, *Camellia sinensis*, *Citrus sinensis*, *Capsicum frutescens*, *Hevea brasiliensis*, *Mangifera indica*, *Persea americana*, *Annona muricata*, *Carica Papaya*, *Vanilla planifolia*, *Musa* spp., *Ficus* spp., *Voacanga Thouarsii*, *Elaeis guineensis*, *Rubus* spp., *Arachis hypogaea* (W. Small in Trans. Brit. Myc. Soc. xi, p. 112; 1926).

11. *GLOMERELLA GOSSYPHII* Edg. in *Mycologia*, i, p. 119 (1909). On cotton bolls, causing anthracnose, Busoga, *Small* 458; Busoga 1929 and Bulemezi 1929, *Hansford*!, rather infrequent and usually associated with abnormal wet weather at the time of ripening.

12. *GLOMERELLA LINDEMUTHIANA* Shear in U.S. Dep. Agr., Bur. Plant Industry, Bull. no. 252, p. 46 (1913). On *Phaseolus* spp., causing anthracnose of pods, Kampala, *Small*!; *Hansford*!; the perithecial stage is developed only in culture and only from a few strains of the fungus.

13. *GLOMERELLA PIPERATA* (Stonem.) Spauld. & v. Schrenk in *Science*, N.S. xvii, p. 750 (1903). Developed perithecia in culture from *Gloeosporium piperatum* Ell. & Ev., isolated from fruits of *Capsicum*, Kampala, April 1938, *Hansford*!

14. *PODOSPORA DECIPIENS* (Wint.) Wint. in Rabenk. Krypt. Fl., II, p. 173 (1885). On dead wood, Kampala, *Hansford* 1095.

15. *LASIOSORDARIA COPROPHILA* (Fr.) Chenantais in Bull. Soc. Myc. France, xxxv, p. 84 (1919). On cow-dung kept in moist chamber in laboratory, Kampala, *Hansford* 1445.

16. *CHAETOMIUM AUREUM* Chivers in Proc. Amer. Acad. XLVIII, p. 86 (1912). Cultured from soil, Toro, June 1931, *Hansford* 1484.

17. *CHAETOMIUM GLOBOSUM* Kunze in Kunze & Schmidt, Mykol. Hefte, i, p. 15 (1817). Common saprophyte on moist cotton seeds, February 1927, Kampala, *Hansford*!

18. *CHAETOMIUM INDICUM* Corda, Icones, iv, p. 38, pl. vii, f. 104 (1840). On damp cotton fibres in laboratory, Kampala, May 1931, *Hansford*!

19. *CHAETOMIUM TRIGONOSPORUM* (March.) Chivers in Mem. Torr. Bot. Club, xiv, p. 166 (1915). On roots of *Citrus sinensis* in moist chamber, Kampala, *Hansford* 1186.

20. *CHAETOMIUM* sp. On dead twigs of *Cinchona*, Entebbe, *Hansford* 821.

Perithecia superficial, globose, 120–160 μ diam., black, membranous, with numerous setae on upper half; setae straight, septate, dark brown-black at the base, lighter towards the attenuate tip, about 180 $\times$ 6 μ . Asci evanescent, 8-spored, subglobose, very thin-walled, about 20 μ diam. Spores citriform, dark brown with lighter thin-walled ends, 5–5.5 $\times$ 4–4.5 μ . The asci are very difficult to determine and most fructifications appear to be conidial on first examination.

The following records of fungi on wood, mostly collected from the forests around Lake Victoria by Maitland, Small and Dummer, are extracted from the lists given by Miss Wakefield (in Kew Bull. 1917, p. 1, and *ibid.* 1920, p. 289):—

21. *Rosellinia asperata* Mass. ex Wakef.
22. *R. bunodes* (Berk. & Broome) Sacc.
23. *R. emergens* (Berk. & Broome) Sacc.
24. *R. subiculata* (Schw.) Sacc.
25. *Daldinia concentrica* Ces. & De Not.
26. *D. Eschscholtzii* (Ehrenb.) Rehm.
27. *Hypoxyylon annulatum* (Schw.) Mont.
28. *H. anthochroum* Berk. & Broome.
29. *H. anthracodes* (Fr.) Sacc.
30. *H. malleolus* Berk. & Rav.
31. *H. atrosphaericum* Cooke & Mass. Kampala, Maitland 295 (det. J. H. Miller).
32. *H. crassum* Matt. & Sacc. Ruwenzori, *Abruzzi Expedition*.
33. *H. distillatum* Berk. & Broome. Magomba, Maitland 373 (det. J. H. Miller).
34. *H. effusum* Nits. Magomba, Maitland 391; Entebbe, Maitland 300 (det. J. H. Miller).
35. *H. glomeratum* Cooke. Kisubi, Maitland 316; Kitubulu, Maitland 386 (det. J. H. Miller).
36. *H. microcarpum* Penz. & Sacc.
37. *H. rubiginosum* Fr. Mabira, Maitland 33; Balisangakibuga, Maitland 172 (det. J. H. Miller).
38. *H. parvimentosum* Ces. Kyewaga, Maitland 412 (det. J. H. Miller).
39. *H. placentaeforme* Berk. & Curt. Nakinyika, Maitland 129; Kibale, Maitland 180 (det. J. H. Miller).
40. *H. quisquillare* Mont.
41. *H. stigmoideum* Ces.
42. *Nummularia repanda* Fr. Magomba, Maitland 406 (det. J. H. Miller).
43. *Ustulina vulgaris* Tul.
44. *U. zonata* (Lév.) Sacc.
45. *Xylaria anisopleura* Mont.
46. *X. apiculata* Cooke.
47. *X. arbuscula* Sacc.
48. *X. carpophila* (Pers.) Fr.
49. *X. citrispora* Wakef.
50. *X. corniformis* Fr.
51. *X. faveolus* Lloyd.
52. *X. flabelliformis* (Schw.) Berk. & Curt.
53. *X. grammica* Mont.
54. *X. Hypoxyylon* Grev.
55. *X. Hypoxyylon* Grev., forma *tropica* Theiss.
56. *X. ianthino-velutina* Mont.

57. *X. involuta* Kl. ex Cooke.
58. *X. Kurziana* Curr.
59. *X. nigripes* (Kl.) Sacc.
60. *X. pallida* Berk. & Curt.
61. *X. pallide-ostiolata* P. Henn. *Small!* (det. C. G. Lloyd)
62. *X. plebeja* Ces.
63. *X. polymorpha* (Pers.) Grev.
64. *X. rhopaloides* Mont.
65. *X. Thwaitesii* Berk. & Curt.
66. *X. vagans* Petch.
67. *Thamnomycetes Chamissonis* Ehrenb.
68. *Kretzschmaria cetrarioides* Welw. & Curr.
69. *K. clavus* Fr.
70. *K. coenopus* (Fr.) Sacc.
71. *Camillea africana* Wakef.

72. *EUDARLUCA AUSTRALIS* Speg. in Rev. Mus. La Plata, xv, p. 22 (1908). On Uredineae; a common parasite of many rust fungi in Uganda, *Hansford 1174, 1407*, etc.

Sydow (in Ann. Myc. xxiv, p. 361; 1926) gives a re-description of this fungus from his collections in Costa Rica, and he inclines to the view that the ascospores are typically only 1-septate, modifying Spegazzini's diagnosis of *Eudarluc*a in this respect. Though Sydow gives no synonymy, his description appears to the writer to include *Didymella dar-luciphila* Speg. and *D. Kariana* Sacc.

73. *MYCOSPHAERELLA AREOLA* Ehrlich & Wolf in Phytopath. xxii, p. 35 (1932). In the conidial stage, *Cercospora Gossypii* Speg., this fungus is common everywhere in Uganda on cultivated cotton.

74. *MYCOSPHAERELLA CONFERTA* (Speg.) Wakef. in Kew Bull. 1920, p. 295. On *Allophylus*, Mulange, *Dummer 4416* (det. Kew).

75. *MYCOSPHAERELLA CROTALARIAE* Petch in Ann. Roy. Bot. Gard. Perad. iii, p. 2 (1906). On *Crotalaria* sp., Kampala, *Small 329*.

76. *MYCOSPHAERELLA DEPAZAEAEFORMIS* (Ces. & De Not.) Wakef. in Kew Bull. 1920, p. 295. On *Oxalis corniculata*, Kipayo, *Dummer 1333* (det. Kew).

77. *Mycosphaerella Dummeri* Hansford, sp. nov.

Maculae brunneae, in centro cinerascetes, secedentes, margine atro-brunneae, usque ad 10 mm. diam., orbiculares vel irregulares. *Perithecia* epiphylla in centro macularum, atra, 90–120 μ diam.; ostiolum conicum erumpens. *Asci* 153 SESS. (1940–I).

fasciculati, clavato-cylindranei, 8-spori, $50 \times 8-10 \mu$, aparaphysati. *Sporae* 2-3-seriatae, cylindraneo-fusoideae, curvulae, 1-septatae, haud constrictae, hyalinae, $16-18 \times 3 \mu$.

Hab. in foliis *Vernoniae* sp., *Dummer* 1303.

78. MYCOSPHAERELLA ERYTHRINAE Koord., Bot. Unters. 1907, p. 189. On *Erythrina tomentosa*, Kampala, *Small* 167.

79. **Mycosphaerella Fici-ovatae**, Hansford, sp. nov.

Maculae dilute brunneae, 3-20 mm. diam., zonatae, margine purpureo-brunneae, orbiculares, saepe confluentes, non secedentes. *Perithecia* epiphylla, in centro macularum gregaria, atra, globosa, immersa, $80-120 \mu$ diam.; ostiola erumpentia. *Asci* clavati, 8-spori, aparaphysati, $40 \times 10 \mu$. *Sporae* 2-3-seriatae, cylindraneo-fusoideae, curvulae, 1-septatae, haud constrictae, $13-15 \times 2.5-3 \mu$.

Hab. in foliis *Fici ovatae*, Kampala, *Small* 333 (leg. T. D. Maitland).

80. MYCOSPHAERELLA GOSSYPINA (Cooke) Atk. in Bull. Torrey Bot. Club, XVIII, 1891, p. 300. On cultivated cotton, Kampala, *Snowden* 702, 716; *Hansford*!

81. MYCOSPHAERELLA LYTHRACEARUM Wolf in Journ. Agr. Res. xxxv, p. 468 (1927). On *Punica Granatum*, Kampala, *Hansford*!; in conidial stage, *Cercospora Lythracearum*, causing a leaf-spot.

82. MYCOSPHAERELLA MORI (Fuckel) Lindau. In the conidial stage, *Septogloeum Mori*, causing a leaf-spot of *Morus alba*, Kampala, *Small* 603; Serere, *Hansford*!

83. MYCOSPHAERELLA PINODES (Berk. & Blox.) Vesterg. in Bih. K. Svenska Vet. Akad. Handl. Stockholm, xxii, Afd. iii, no. 6, p. 15 (1896).

A species of *Ascochyta* corresponding, closely to the conidial stage of the above, is extremely common on *Phaseolus* spp. and *Vigna* spp. in most parts of Uganda, especially in dry weather.

84. MYCOSPHAERELLA CARICAE Maubl. in Bull. Soc. Myc. France, xxix, p. 358 (1913) as *Sphaerella*. On leaves of *Carica Papaya* Kampala, *Hansford* 2367 p.p.

85. **Mycosphaerella contraria** Hansford, sp. nov.

Perithecia $80-110 \mu$ diam., atra, globosa, sparsa, glabra; ostiolum erumpens. *Asci* numerosi, fasciculati, clavati, 8-spori, aparaphysati, $40 \times 6-8 \mu$. *Sporae* 2-seriatae, hyalinae, ellipsoideae, leves, 1-septatae, haud constrictae, $9-12 \times 2 \mu$.

Hab. in foliis *Dioscoreae* sp., Kampala, *Hansford* 2095 (leg. P. Chandler).

The conidial stage of this was determined by the Imperial Mycological Institute as *Cercospora contraria* Syd. The perithecia develop on the older leaf-spots still bearing the conidial stage.

86. MYCOSPHAERELLA sp. On leaves of *Phormium tenax*, Entebbe Botanic Gardens, *Hansford 1878*.

Perithecia epiphyllous in dead areas of the leaf; spots grey-brown, irregular, often large. Perithecia immersed with erumpent ostioles, black, crowded, thin-walled, smooth, $80-100\ \mu$ diam. Asci fasciculate from base of perithecium, paraphysate, clavate, 8-spored, $45 \times 10-12\ \mu$. Spores 2-seriate, hyaline, ellipsoid, smooth, 1-septate, not constricted, $10-13 \times 3.5-4.5\ \mu$.

87. GIBBERA GUARANTITICA Speg., Fung. Guar., Pug. i, no. 222, p. 91 (1883). On dead stem of *Phoenix reclinata*, Kipayo, *Dummer 2152*; Mubende Road Forests, *Maitland 213* (det. Kew).

88. ACAROTHALLIUM HANSFORDII Syd. in Ann. Myc. xxxv, p. 267 (1937). On leaves of *Rubiaceae* (? *Canthium* sp.) Masaka Road, *Hansford 1326*.

89. BOTRYOTHECIUM UGANDENSE Syd. in Ann. Myc. xxxv, p. 260 (1937). On leaves of *Croton macrostachys*, Kampala, *Hansford 1480*.

90. PSEUDOTHIS sp. On leaves of *Albizzia zygia*, Serere, *Hansford 1607*.

This is identical with collections by F. C. Deighton on the same host in Sierra Leone; the conidial stage is *Lasmeniella* sp., originally described as *Coniosporium Albizziae* by P. Hennings.

91. DIDYMOSPHAERIA PANICI March. & Stey. in Bull. Soc. Roy. Bot. Belg. lxi, p. 161 (1929). On dead culms of *Pennisetum purpureum*, Kampala, *Hansford 1118*; on dead culms of *Hyparrhenia* sp., Kampala, *Hansford 1109*.

92. ACANTHOSTOMA REFLEXUM Syd. in Ann. Myc. xxxvii, p. 208 (1939). Parasitic on mycelium of *Asterina* sp., on leaves of *Whitfieldia* sp., Entebbe Road Forests, *Hansford 2366*.

93. NEOPECKIA DIFFUSA (Schw.) Starb., Studier Fries herb. p. 30 (1894). On dead wood, *Dummer 1421, 3948, 4826* (det. Kew).

94. NEOPECKIA RHODOSTOMA Syd. in Ann. Myc. xv, p. 204 (1917). On dead wood, *Dummer 4207* (det. Kew).

95. OTTHIA DEFORMANS Pat. in Bull. Soc. Myc. France, xxxiv, p. 90 (1918). On *Erica arborea*, Ruwenzori, *Abruzzi 153* sess. (1940-1).

Exped. (sub *Aloysiella ruwenzoriensis* Matt. & Sacc.). Sydow (in Ann. Myc. xviii, p. 182 ; 1920) states that this is a synonym of Patouillard's fungus.

96. *VALSARIA INSITIVA* (De Not.) Ces. & De Not., Schema Sfer. p. 205. On dead wood, Kampala, *Hansford* 829.

97. *CERATOSPHERIA LAMPADOPHORA* (Sacc.) Niessl. in Verh. Naturforsch. Ver. Brunn, xiv, p. 45 (1876). Associated with *Hypoxylon* sp., Wakigu Forest, *Maitland* 95 (det. Kew).

98. *PHANEROCOCCUS TRICHOPHILUS* Syd. in Ann. Myc. xxxv, p. 265 (1937). On leaves of *Panax fulvus*, Kipayo, *Dummer* 1486.

99. *NEMATOSTIGMA CLAVISPORUM* Syd. in Ann. Myc. xxxv, p. 263 (1937). Parasite on *Schiffnerula Brideliae* on *Bridelia micrantha*, Kampala, etc., *Hansford* 1079 p.p., 1229, 1331 a, 1332, 1958, 2404 ; on *Schiffnerula Toddaliae* on *Toddalia asiatica*, *Hansford* 1456.

100. *Leptosphaeria Hyparrheniae* Hansford, sp. nov.

Perithecia immersa, globosa, atra, sparsa, 100–130 μ diam. ; paries tenuis, parenchymaticus ; ostiola erumpentia, conica. *Asci* cylindracei, basi attenuati breviter pedicellati, 8-spori, 80–100 $\times$ 12–14 μ ; paraphyses filiformes. *Sporae* olivaceae, fusoideae, curvulae, utrinque acutae, 3-septatae, in medio constrictae, leves, 32–39 $\times$ 5–6 μ .

In culmis emortuis *Hyparrheniae* sp., Kampala, *Hansford* 983, 1107.

101. *LEPTOSPHERIA IWAMOTII* Miy. in Jour. Coll. Agric. Imp. Univ. Tokyo, II, p. 249 (1910). On *Oryza sativa*, Kampala, *Small* (Circ. 8, Dep. Agric., Uganda, 1922).

102. *LEPTOSPHERIA LEERSIAE* Pass, Fung. Parm. IV, p. 43. On *Leersia hexandra*, Masindi, *Hansford* 1213.

103. *LEPTOSPHERIA MICHOTII* (West.) Sacc. in Syll. Fung. II, p. 58 (1883). On *Oryza sativa*, Kampala, *Small* !

104. *Leptosphaeria Penniseti* Hansford, sp. nov.

Perithecia erumpentia, sparsa, globosa, atra, 500–600 μ diam. ; ostiola conica. *Asci* cylindracei, 8-spori, 110–130 $\times$ 11–14 μ ; paraphyses numerosae, simplices, filiformes. *Sporae* obliquae, 1–2-seriatae, brunneae, fusoideae, leves, 3-septatae, medio constrictae, saepe curvulae, 20–24 $\times$ 6–8 μ .

Hab. in culmis emortuis *Penniseti purpurei*, Kampala, *Hansford* 982.

105. *LEPTOSPHERIA* *PROTEARUM* Syd. in Ann. Myc. x, p. 441 (1912). On leaves of *Protea madiensis*, Lumbwa, Kiagwe, *Dummer* 2863 (det. Kew); Serere, *Hansford* 1617.

106. *LEPTOSPHERIA* *SACCHARI* Breda de Haan in Meded. Proefstat. West-Javas, 1892, p. 25. On leaves of sugar-cane, Kampala, *Small* 13; *Hansford*!

107. *Leptosphaeria Trichopterygis* Hansford, sp. nov.

Perithecia erumpentia, gregaria vel sparsa, atra, globosa, membranacea, circa $600\ \mu$ diam.; ostiola usque ad $400\ \mu$ alt., conica. *Asci* cylindraceo-clavati, breviter pedicellati, $80-90 \times 9-12\ \mu$; paraphyses filiformes, simplices. *Sporae* clavatae, apice rotundatae, basi attenuatae, brunneae, leves, 5-6-septatae, haud constrictae, $22-40 \times 4-5\ \mu$.

In culmis emortuis *Trichopterygis afroflamidae*, Gayaza, *Hansford* 1175.

108. *LEPTOSPHERIA* *TRITICI* (Gar.) Pass. in Microm. Ital. diagn. no. 859; Sacc. Syll. II, p. 62. On wheat, Kampala, *Small* 598.

109. *Trematosphaeria kampilense* Hansford, sp. nov.

Perithecia primo immersa, demum fere superficialia, usque ad $900\ \mu$ diam., atro-carbonacea, basi dentibus corticis disruptis cincta; ostiola conica. *Asci* cylindracei, breviter pedicellati, 8-spori, $170-210 \times 10-15\ \mu$; paraphyses filiformes, $200 \times 1\ \mu$. *Sporae* 2-seriatae, fusioideae, utrinque acutae, brunneae, leves, 5-septatae, haud constrictae, $58-66 \times 5-6\ \mu$.

Hab. in culmis emortuis, Kampala, *Hansford* 1161.

110. *GIBBERIDEA* *ZINGIBERACEARUM* Rac. in Bull. Acad. Sci. Cracovie, 1909, p. 385. On *Amomum* sp., Entebbe, *Maitland* 279 (det. Kew).

111. *HEPTAMERIA* *OBESA* (Dur. & Mont.) Sacc., Syll. II, p. 88. On dead stem of *Ageratum conyzoides*, Kampala, *Hansford* 1124.

112. *FENESTELLA* *VESTITA* (Fr.) Sacc. in Michelia, I, p. 50. On dead wood, Kampala, *Hansford* 1511.

113. *OPHIOCERAS* *BAMBUSAE* v. Hoehnel in Sitzber. k. Akad. Wiss. Wien, CXVIII, p. 337. On dead culms of *Pennisetum purpureum*, Kampala, *Hansford* 1160.

HYPOCREACEAE.

1. *MELANOSPORA* *ERYTHRAEA* Moll. in Schimper, Bot. Mitt. IX, p. 294 (1901). The perithecial stage of *Monilia carbonaria*, a common fungus on charred wood and grass culms in Uganda; also a common laboratory weed.

2. MELANOSPORA ZAMIAE Corda, Icones Fung. i, p. 24 (1837). Common saprophyte on paper, dead wood, etc., occasional in soil; *Small 585, Snowden 682, Hansford!*

3. NEOCOSMOSPORA VASINFECTA E. F. Sm. in U.S. Dep. Agr. Bull. no. 17, p. 45 (1899). Cultured from dead stems of *Crotalaria striata*, Serere, *Hansford 1497*; from *Tephrosia* sp., Serere, *Hansford 1587*.

4. SARCOXYLON AURANTIACUM Pat. in Bull. Soc.⁴ Myc. France, xxvii, p. 331 (1911). On wood, Kipayo, *Dummer 1443*; Balisangakibuga, *Maitland 195 (det. Kew)*.

5. ENGLEROMYCES GOETZEI P. Henn. in Engl. Bot. Jahrb. xxviii, p. 327 (1900). On stems of Bamboos, Mt. Elgon, *Dummer 3448*; Kigezi, *Hansford!*

6. NECTRIA BICOLOR Berk. & Broome in Journ. Linn. Soc. Lond. xiv, p. 116 (1873). *Maitland 575, 576 (det. Kew)*.

7. NECTRIA BINOTIANA Sacc. in Bull. Soc. Roy. Belg. xxxv, p. 129 (1896). On twigs of *Camellia sinensis*, Kampala, *Small 608 (det. Kew)*.

8. NECTRIA COCCOPHILA (Tul.) Wollenw. & Reink., Die Fusarien, p. 34 (1935). On scale insects on *Hovenia dulcis*, Kampala, *Hansford 2137*.

9. NECTRIA EPISPHAERIA (Tode) Fr. in Summ. Veg. Scand. p. 388. On wood, Mabira Forest, *Maitland 34*; *Dummer 629 (det. Kew)*.

10. NECTRIA EPISPHAERIA (Tode) Fr., var. CORONATA Wollenw. in Zeitschr. Parasitenkunde, III, p. 298 (1931). Common on old perithecia of various fungi; on dead wood, Kampala, *Hansford 1530*; conidial stage (*Fusarium aquaeductuum*) cultured from *Catacauma* sp. on *Ficus*, Kampala, *Hansford 1380*.

11. NECTRIA FLAVO-LANATA Berk. & Broome in Journ. Linn. Soc. Lond. xiv, p. 114 (1873). On dead stem of *Theobroma Cacao*, Mabira, *Maitland 227*; on *Grevillea robusta*, *Small 536*; on dead branches of *Gliricidia sepium*, Kampala, *Hansford 1509, 1513, 2053*, common.

In culture the conidia are of the *Cephalosporium* type, 0-1-septate, $7-15 \times 3.5-5 \mu$, usually ellipsoid, sometimes bent, occasionally somewhat piriform. Occasional abnormal spores are up to 3-septate and larger, but none of typical *Fusarium* type are produced.

12. NECTRIA JUNGNERI P. Henn. in Engl. Bot. Jahrb. xxii, p. 75 (1895). On wood, Masaka Road, *Hansford 2054*.

13. *NECTRIA OCHROLEUCA* (Schw.) Berk. in Grevillea, iv, p. 16 (1875). On decaying *Piptadenia africana*, Kipayo, Dummer 1431 (det. Kew).

14. *NECTRIA STENOSPORA* Berk. & Broome in Journ. Linn. Soc. Lond. xiv, p. 115 (1873). On wood, Maitland 14, 35 (det. Kew).

15. *NECTRIA TUBERCULARIAE* Petch. in Trans. Brit. Myc. Soc. vii, p. 157 (1921). On scale insects on *Citrus*, Kampala, Hansford 922, 1498, 1773.

16. *NECTRIA VILIOR* Starb. in Bih. K. Svenska Vet. Akad. Handl. Stockholm, xxv, Afd. iii, no. 1, p. 28 (1899). On *Hypoxyton* sp., Kisubi, Maitland 310; on *Ustulina vulgare*, Dummer 629; on *Didymosphaeria* sp., Hansford 1524; on ? *Valsa* sp., Hansford 1510.

17. *LISEA VIOLACEA* (A. L. Sm.) Sacc. in Hedwigia xxxv, p. xxxiii (1896). On wood, Masaka Road, Hansford 2053 p.p. Perithecia in groups on central stromata, up to 360 μ diam. Asci cylindric, about $72 \times 7 \mu$; spores 1-septate, $5-12 \times 2.5-5 \mu$. On wood, Kampala, Hansford 1097.

18. *HYPOMYCES HAEMATOCOCCUS* (Berk. & Broome) Wollenw. in Angew. Bot. viii, p. 180 (1926). On wood, Mt. Elgon, Small 134 (det. Kew); Kampala, Hansford 1509, 1512; common.

19. *HYPOMYCES IPOMOEAE* (Halst.) Wollenw. in Phytopath. iii, p. 34 (1913). Cultured from dead wood, Kampala, Hansford 1569.

20. *SPHAEROSTILBE* sp.

Synnemata erect, closely crowded, up to 1 mm. high; stalk pale yellow, cylindric, straight, simple, smooth, 40–100 μ diam., expanding above into the base of a terminal blood-red spherical head of conidia, 250 μ diam. Conidia ovate, smooth, pale yellow, continuous, $4-6 \times 2.5 \mu$. Perithecia superficial or sometimes erumpent, thin-walled, red-brown, ostiole paler, globose, 250–320 μ diam., smooth. Asci cylindric, 8-spored, $40-70 \times 6-9 \mu$. Spores obliquely 2-seriate, ellipsoid, straight, 1-septate, not constricted, hyaline, smooth, $12-16 \times 3.5-5.5 \mu$.

On wood, Kampala, Hansford 1133, 1166.

21. *STILBOCREA* sp.

Stromata, when fresh, pink to red-orange, convex, pulvinate, up to 20 mm. long by 10–20 mm. wide and 1–3 mm. high, consisting of irregularly swollen areas with folds between, firm in texture, smooth, attached over the whole base. Conidial

stalks erect or divergent, concolorous, up to 1.5 mm. high by 80–140 μ diam., each with a dark red globule of conidia at the apex, 200 μ diam. Conidia small, ovate, hyaline to yellowish, smooth, continuous, about $3 \times 2 \mu$. Perithecia sunken in stroma, the ostioles hardly projecting even when dry and in a single series over the whole upper surface of the stroma, 200–280 μ high by 160–200 μ diam., closely crowded. Ostiole lined with periphyses and darker than rest of perithecium. Asci aparaphysate, cylindric, $110\text{--}140 \times 7 \mu$, opening by an apical pore, 8-spored. Spores ovate, 1-septate, slightly constricted, verrucose, hyaline, white in mass, not separating into part-spores, $12\text{--}14 \times 5\text{--}6 \mu$.

On wood, Masaka Road, *Hansford 1998*; Entebbe Road, *Hansford 2059*.

22. *HYPOCREA CATOPTRON* Berk. & Broome in Journ. Linn. Soc. Lond. XIV, p. 112 (1873). On wood, Entebbe Road Forests, *Hansford 2060*.

23. *HYPOCREA CONFUSA* Petch in Ann. Roy. Bot. Gard. Perad. VII, p. 93 (1920). On wood, Mabira Forest, *Dummer 4041*.

24. *HYPOCREA GELATINOSA* (Tode) Fr., Summ. Veg. Scand. p. 383. On wood, Mabira Forest, *Maitland 4* (det. Kew).

25. *HYPOCREA INSIGNIS* Berk. & Curt. in Journ. Linn. Soc. Lond. X, p. 376 (1869). On wood, Mabira Forest, *Maitland 22*; *Dummer (Small 451)* (det. Kew).

26. *HYPOCREA MAITLANDII* C. G. Lloyd in Myc. Notes, VII, p. 1257. On wood, *Maitland 170*.

27. *HYPOCREA SUBCITRINA* Kalchbr. & Cooke in Grevillea, IX, p. 26 (1880). On wood, Mubende Road, *Maitland 143* (det. Kew).

28. *Paranectria flagellata* Hansford, sp. nov. (Fig. 3.)

Perithecia brunnea, ovata, membranacea, 90–170 μ alt. et 90–120 μ diam., saepe conica, superficialia; ostiolum planum pallidum; stroma nullum. *Asci* numerosi, clavato-cylindracei, breviter pedicellati, $65\text{--}80 \times 12\text{--}15 \mu$, 8-sporei; paraphyses numerosae, hyalinae, filiformes, simplices, $60\text{--}80 \times 1 \mu$. *Sporae* hyalinae vel sub-hyalinae (vel rarius dilute olivaceae), clavatae, apice subacutae, 3–5-septatae, $35\text{--}45 \times 3\text{--}3.5 \mu$, basi attenuatae in appendicem filiformem $30\text{--}50 \times 1 \mu$; sporeae 85–95 μ longae.

Hab. cum *Arthrosporio parasitico* in plagulas *Ireninae glabrae* in foliis *Coffeae robustae*, Kiagwe, *Hansford 1357*; Kampala, *Hansford 1871 p.p.*

The fungus appears to be the perithecial stage of *Arthrosporium parasiticum* Wint. ; in the ascus the spores are sometimes arranged in two opposed groups of four parallel spores with reflexed appendages, or in other asci the bodies of the

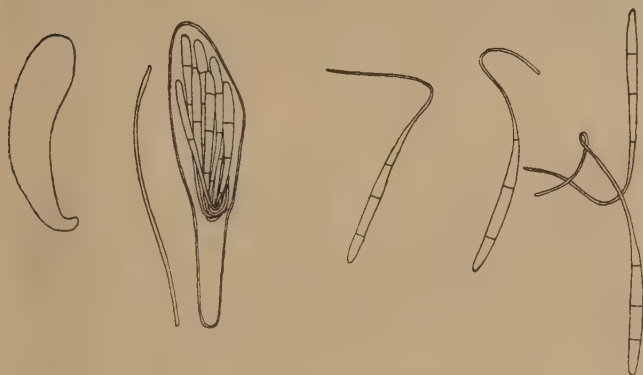


FIG. 3.—*Paranectria flagellata*: asci, paraphysis and spores, $\times 500$.

eight spores are together parallel at the top of the ascus, with the appendages reflexed. The occasional yellow to olive spores are not deemed sufficient to remove this fungus from *Paranectria*.

29. *Paranectria meliolicola* Stevens in Bot. Gaz. LXV, p. 232 (1918), var. **major** Hansford, var. nov. (Fig. 4.)

A typo differt :—*Perithecia* hyalina vel pallida, usque ad $160\ \mu$ alt. et $130\ \mu$ diam. *Setae peritheciales* 5–9, usque ad $80\ \mu$ longae, subrectae, simplices, acutae. Asci usque ad $80 \times 40\ \mu$. *Sporae* inaequilaterales, 3–5-septatae, $27\text{--}34 \times 8\text{--}10\ \mu$; appendices rectae, $5\text{--}7 \times 1.5\ \mu$.

On *Meliola Paullinae* on *Paullinia pinnata*, Entebbe Road, Hansford 1822.

The spores are sometimes slightly constricted at the middle septum and the upper half is slightly broader than the lower; they are liberated through the terminal pore of the ascus.

Specimens corresponding very closely to Stevens' description of the type were found by the writer on *Heller 6400* (in Herb. Kew). This specimen is quoted by Earle as the type of his *Pseudomeliola collapsa* (Bull. New York Bot. Gard. 1904, p. 39), and examination of the Kew material shows that the collection contains *Paranectria meliolicola* Stevens and another parasite on the *Meliola* present. This second parasite has a densely

interwoven mycelium of agglutinate hyphae, $2-3\mu$ wide, indistinctly septate hyaline. The perithecia are scattered, globose-depressed to cupulate, white around the sides, the top appearing honey-yellow; apparently not ostiolate. The wall of the perithecium is covered with a layer of closely interwoven hyphae, beneath which the structure could not be determined. No perithecial setae are present. Perithecia up to 200μ or more in diameter; asci very numerous, 8-spored,

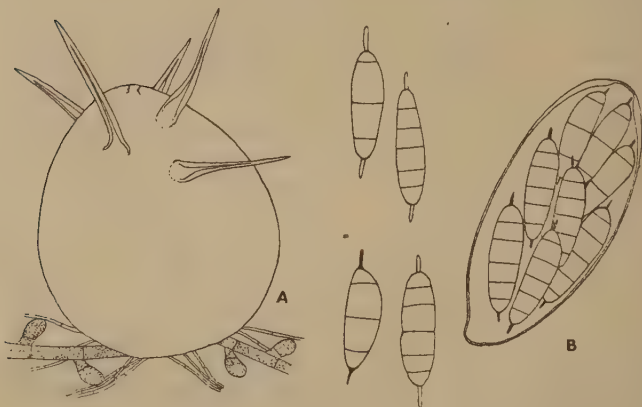


FIG. 4.—*Paranectria meliolicola* var. *major* (no. 1882):
A, perithecium; B, ascus and spores, $\times 300$.

about $40 \times 8\mu$. Spores 2-3-seriate, oblique, 3-4-guttulate, fusoid, slightly bent, hyaline, smooth, ? 1-septate, $12-15 \times 3\mu$. Paraphyses apparently none.

Comparing this with Earle's description of *Pseudomeliola*, it becomes evident that he described the perithecia of *Paranectria meliolicola* and the asci and spores of the second parasite, which appears to be an immature *Calonectria*. Earle's name should therefore be rejected as a *nomen confusum*.

30. *Paranectria minuta* Hansford, sp. nov. (Fig. 5.)

Mycelium ex hyphis hyalinis $2-3.5\mu$ crassis septatis agglutinatis reticulatis compositum. *Perithecia* numerosa, globosa, albida, $80-100\mu$ diam., apice pertusa poro 40μ diam. setis $15-20$ cincto. *Setae* hyalinae, rectae vel nodulosae, superne attenuatae, obtusae vel subacutae, continuatae, rigidae, membrana incrassata, usque ad 50μ longae et $4-6\mu$ crassae. *Asci* numerosi, fasciculati, aparaphysati, cylindraneo-ellipsoidei, 8-sporei, circa $50 \times 15\mu$; *sporae* 2-3-seriatae hyalinae,

biconicae, 1-3-septatae, in medio leniter constrictae, plus minusve curvulae, $18-20 \times 5-6 \mu$, utrinque appendicem rigidam $7-10 \times 0.5-1 \mu$ rectam ornatae.

Hab. in plagulas *Meliolae Paullinae* parasitica, in foliis *Paullinae pinnatae*, Entebbe Road, Hansford 2528.

The fungus is pure white, forming a thin white mycelial plate over the colony of the host fungus, with closely scattered, very

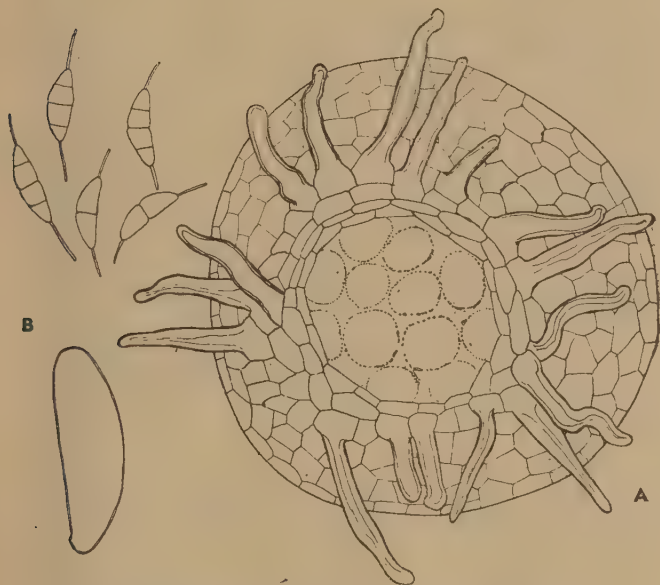


FIG. 5.—*Paranectria minuta* (no. 2528). A, surface view of perithecium; B, ascus and spores, $\times 500$.

numerous perithecia. The perithecial wall consists of a single layer of delicate, compressed, angular-rounded hyaline cells, $8-10 \mu$ diam., $4-5 \mu$ thick, which are narrower and elongated around the terminal pore. The setae are arranged in a single irregular ring around the apex of the perithecium.

31. *Paranectria Hemileiae* Hansford, sp. nov. (Fig. 6.)

Mycelium ex hyphis hyalinis tenuibus ramosis $2-4 \mu$ crassis indistincte septatis compositum, inter sporas *Hemileiae* reticulatum. *Perithecia* superficialia, flavida vel aurea, subglobosa, ostiolata, $70-100 \mu$ diam. Setae peritheciales numerosae, simplices, subrectae, obtusae, circa $20 \times 5 \mu$. Asci clavato-cylindracei, basi attenuati, 8-spори, $60-75 \times 10-12 \mu$. Sporae

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oblique 1-2-seriatae, ovatae vel bi-conicae, 1-(3)-septatae, haud constrictae, leves, $16-19 \times 5-6 \mu$; appendices simplices, obtusae, $5 \times 1 \mu$.

Hab. in soris *Hemileiae vastatricis* in foliis *Coffeae*, Kampala, Hansford 1870.

The fine hyphae of this fungus penetrate the walls of the *Hemileia* host, the spores of the latter being emptied of their coloured contents, so that heavily infected sori appear almost

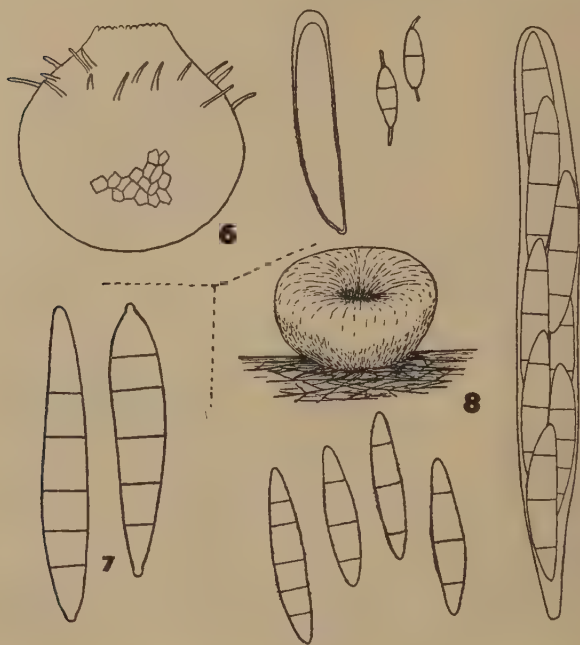


FIG. 6.—*Paranectria Hemileiae*, perithecium, $\times 250$: ascus and spores, $\times 500$.

FIG. 7.—Spores of *Paranectria Ugandae* (no. 1540), $\times 1000$.

FIG. 8.—*Calonectria Meliolae*, perithecium, $\times 75$: ascus and spores, $\times 500$.

white instead of bright red-orange. The perithecial setae are arranged in an indefinite ring around the base of the blunt conic ostiole; the perithecial wall consists of a single layer of thin hyaline parenchyma, through which the asci are visible.

32. *Paranectria Ugandae* Hansford, sp. nov. (Fig. 7.)

Perithecia superficialia, candida vel flava, $100-130 \mu$ diam., setosa. *Setae* hyalinae, continuae, aliae rigidae rectae

acutae $30-50 \times 5-8 \mu$, aliae longiores obtusae, usque ad $120 \times 5 \mu$. *Asci* numerosi, aparaphysati, clavati, 4-spори, circa $70 \times 20 \mu$. *Sporae* fusoideae, rectae utrinque acutae, hyalinae (4-)5-(6)-septatae $40-50 \times 6-8 \mu$, superne crassiores.

Hab. in plagulas *Irenopsidis Bosciae* in foliis *Capparidis Afzelii*, Entebbe Road, *Hansford* 1540 p.p.

Some spores have blunt terminal appendages about $2 \times 2 \mu$, while others have merely acute ends; occasional spores are slightly constricted at the septa.

33. *PARANECTRIA WILDEMANNIANA* P. Henn. in Mission E. Laurent, III, p. 316 (1906). Parasitic on *Meliola* on unknown host, Nkokonjeru, Bugishu, *Hansford* 800.

34. *CALONECTRIA GUARAPIENSIS* Speg., Fung. Guar., Pug. I, no. 247. Parasitic on *Irenina* sp. on *Acalypha fruticosa*, Kiagwe, *Dummer* 1336.

This material also contains conidiophores of either *Eriomycopsis tenuis* or of *Acremonium Meliola*; but no conidia were found.

35. *CALONECTRIA INCONSPICUA* Wint. in Rev. Mycol. VII, p. 207 (1885). On *Meliola Tecleae* on *Teclea nobilis*, Kazi, Kampala, *Hansford* 1909 p.p.; on *Meliola microspora* on *Hoslundia oppositifolia*, Kampala, *Hansford* 1188.

(*Ule* 1386, on *Meliola* on *Cissus* sp., Brazil, in Herb. Kew, satisfies the description of this species, and differs from *C. guarapiensis* mainly in the absence of a dense, plainly visible colony.)

36. *CALONECTRIA LEUCORRHODINA* Speg. in Anal. Soc. Cient. Argent. XII, Fung. Arg. IV, no. 204 (1881). Parasitic on *Meliola Chandleri* on *Acalypha* sp., Entebbe Road, *Hansford* 1852.

The perithecia are not setose as in *C. guarapiensis*. Conidia are present on this material and are of 'Oospora'-type: the conidiophores are scattered or in very loose 'sporodochia', arising as erect branches of the creeping hyaline mycelium, 1-septate, simple, $15-20 \mu$ high, forming a single simple terminal chain of conidia. Conidia white in mass, hyaline, long ovate to fusiform in chains of up to ten, continuous, smooth, thin-walled, $5-10 \times 2 \mu$.

37. *Calonectria Meliolae* Hansford, sp. nov. (Figs. 8 and 9.)

Perithecia sparsa, superficialia, carnea, globosa, glabra, $240-360 \mu$ diam.; ostiolum depressum. *Asci* numerosi, cylindricei, 8-spори, $150-180 \times 15-20 \mu$; paraphyses filiformes, 1μ crassae. *Sporae* fusoideae, rectiusculae, hyalinae, leves, 3-(5)-septatae, saepe leniter constrictae, $42-52 \times 8-10 \mu$, 2-seriatae. *Conidiophora* in greges (-20) laxae aggregata,

erecta, 280–360 μ longa, hyalina, septata, 6–8 μ crassa, simplicia, sursum nodulosa. *Conidia* terminalia, hyalina, fusoidea, curvula, 3–4-septata, leniter constricta, basi breviter attenuata in hilo plano, apice attenuata in appendicem filiformem usque 40 μ longam et 1.5–2 μ crassam; corpus sporae 45–60 $\times$ 11–13 μ .

Hab. in plagulas *Meliolae Tecleae* in foliis *Tecleae nobilis*, Kazi, Kampala, *Hansford 1909 p.p.*

In this material the fungus is mixed with *C. inconspicua*, from which it is easily distinguished by its larger size and by the presence of conidia. The latter are closely related to the genus *Eriomycopsis*, but the conidiophores do not retain the

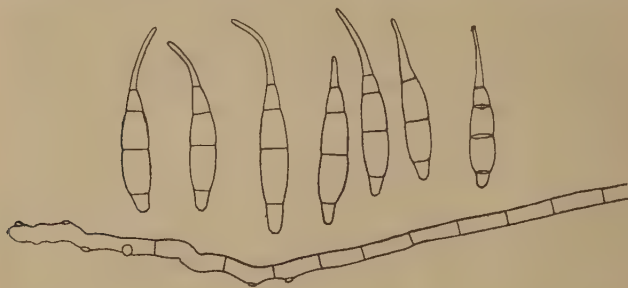


FIG. 9.—*Calonectria Meliolae*: conidiophore and conidia, $\times 333$.

base of the conidia after shedding, as in *E. Bonplandii* and *E. tenuis*. The mycelium forms a thin white sheet over the colonies of the host fungus, extending beyond these over the leaf surface. The colour of the perithecia is entirely due to the contents, the wall being colourless and consisting of two or three layers of parenchymata, softer and more fibrillose internally. The shape of the base of the conidium is a characteristic truncated cone, but the development of the apical appendage is very variable and sometimes it is hardly present.

38. *Calonectria kampalense* Hansford, sp. nov.

Perithecia caespitosa, carnea vel flavida, glabra, globosa, 200–250 μ diam., superficialia; stroma nullum. *Asci* apophysati, clavati, 8-sporei, 90–115 $\times$ 14–15 μ . *Sporae* curvulae, cylindratae, utrinque acutae, hyalinae, leves, 5–9-septatae, haud constrictae, 32–38 $\times$ 4–5 μ ; cellulae 2-guttulatae.

Hab. in foliis emortuis humidis *Musae Sapiientium* Kampala, *Hansford 1887*.

The spores are 2–3-seriate in the ascus. The fungus is probably a soil organism, being found on flower-pots filled

with soil and kept moist, these (called in Luganda 'byai') being made from old leaves and strips from the 'stem' of banana plants.

39. *Calonectria rigidiuscula* (Berk. & Broome) Sacc. in *Michelia*, I, p. 313 (1878). Common in perithecial and conidial (*Fusarium decemcellulare*) stages on dead wood, especially of leguminous shrubs and trees, in moist places, *Hansford 1571*, etc.

40. *Calonectria Ugandae* Hansford, sp. nov. (Figs. 10 and 11.)

Mycelium ex hyphis hyalinis septatis agglutinatis $2.5-4\mu$ crassis compositum. *Perithecia* sparsa, primo alba, in maturitate rosea, globosa, $100-170\mu$ diam., apice poro $10-15\mu$ pertusa. Paries parenchymaticus ex stratis 2-3-cellularum rotundato-angulatarum $5-8\mu$ diam. compositus. *Setae peritheciales* circa 20, simplices, obtusae, incrassatae, hyalinae,

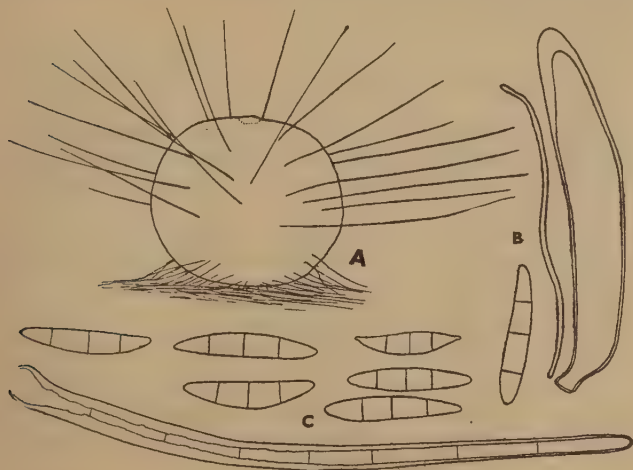


FIG. 10.—*Calonectria Ugandae*. A, perithecium, $\times 150$; B, ascus and spores, $\times 500$; C, perithecial seta, $\times 500$.

usque ad 180μ longae et $6-7\mu$ crassae, basi leniter bulbosae. *Asci* numerosi, cylindracei, $90-110 \times 12-18\mu$, 8-spори, apice incrassati; paraphyses simplices, filiformes, $1-1.5\mu$ crassae. *Sporae* 2-3-seriatae, fusioideae, leniter curvulae, hyalinae, leves, utrinque rotundatae, 3-septatae, haud constrictae, $35-40 \times 6-7.5\mu$.

Hab. in plagulas *Irenis natalensis* parasitica, in foliis *Oncobae spinosae*, Entebbe Road, *Hansford 2490*.

The mycelium forms almost a solid plate over the host colony. The perithecial setae are scattered more or less evenly over the upper half of the perithecium, and on its lower surface some cells grow out into mycelial hyphae and assist in supporting the perithecium. The upper half of the spores is sometimes very slightly wider than the lower.

The fungus has as its conidial stage an *Eriomycopsis*. Its conidiophores are erect branches from the mycelium, simple, septate, $200-300 \times 5-6 \mu$, slightly bulbous at the base. The terminal cell produces single conidia on short blunt sterigmata, $1 \times 1 \mu$, grouped around the terminal portion.



FIG. 11.—*Calonectria Ugandae*: conidiophore and conidia, $\times 333$.

Conidia fusoid-falcate (3)–4–(5)-septate, more curved at apex, attenuate to rounded apex and to truncate base, hyaline, smooth, not constricted, very thin-walled and soon collapsing, $45-65 \times 7-9 \mu$.

(The specimen *Deighton CB825* on *Meliola* sp. on *Milletia* sp., Gold Coast, corresponds very closely to the conidial stage of the present fungus.)

41. *GIBBERELLA BACCATA* (Wallr.) Sacc. in *Michelia*, I, p. 318 (1878). On dead wood, Kampala, *Hansford 1482*.

42. *GIBBERELLA PSEUDOPULICARIS* Wollenw. in *Zeitschr. f. Parasitenkunde*, III, p. 387 (1931). On dead branches of *Gliricidia sepium*, Kampala, *Hansford 1770, 1772*, on dead wood, Kampala, *Hansford 1530, 1567*.

43. *GIBBERELLA SAUBINETII* (Mont.) Sacc. in *Michelia*, I, p. 513 (1879). On *Oryza sativa*, Kampala, *Snowden 571*; on *Triticum vulgare*, Mbale, *Snowden 995*; on *Zea Mays*, Masindi, *Hansford 1011* (*leg. Hargreaves*); on *Andropogon* sp., Kampala, *Hansford 1573*.

44. *PLEONECTRIA PSEUDOTRICHIA* (Schw.) Wollenw. in *Angew. Bot.* VIII, p. 184 (1926). On wood, *Dummer 641, 1144*; *Small 4, 292*; *Maitland 144, 188*; *Snowden 980*; *Hansford* !; common.

45. *OOMYCES JAVANICUS* v. Hohnel in Sitz. Akad. Wiss. Wien, CXVIII, p. 314 (1909). On leaves of unknown plant, Entebbe Road, *Hansford 1538*; on leaves of *Honckenya* sp., Mukono, *Hansford 1976*.

46. *TORRUBIELLA ALBA* Petch in Trans. Brit. Myc. Soc. XVI, p. 226 (1932). On spiders, Mukono, *Hansford 1983* (*det. Petch*).

47. *PODONECTRIA COCCICOLA* (Ell. & Ev.) Petch in Trans. Brit. Myc. Soc. VII, p. 161 (1921). On scale insects on *Citrus*, Kampala, *Hansford 1499, 1773*; common in both perithecial and conidial stages (*Tetracrium coccicolum* von Hoehnel).

48. *Claviceps Digitariae* Hansford, sp. nov.

Stromata in ovariis *Digitariae* glumis partim cineta, levia, ovata, nitida, dura, $2-2.5 \times 1.5$ mm., apice acutiuscula. Post 2-3 menses in solo humido stroma germinat, tumescit ad 3×2 mm. et caulem cylindricum albo-flavidum nitidum



FIG. 12.—*Claviceps Digitariae*. A, germinating sclerotium, $\times 7.5$; B, clava, $\times 30$; C, asci and spores, $\times 500$.

usque 20×0.5 mm. effert. Apex caulis globosus $500-750 \mu$ diam., albo-flavidus, asperulus; ostiola prominentia, purpurea. *Perithecia* immersa, ovata, circa 160μ alt. et $100-140 \mu$ diam. *Asci* numerosi, cylindracei, $120-140 \times 4-5 \mu$, 8-spори, apara-physati. *Sporae* filiformes, $100-120 \times 0.5-1 \mu$.

Hab. in inflorescentis *Digitariae scalaris*, Kampala, Hansford 1483.

Occasionally more than one stalk, and head is produced from a single sclerotium.

49. *CORDYCEPS BICEPHALA* Berk. in Hooker's Journ. Bot. 1856, p. 278. On an ant, *Dummer 4033* (det. T. Petch).

50. *CORDYCEPS DIPTERIGENA* Berk. & Broome in Journ. Linn. Soc. Lond. xiv, p. 111 (1873). On a fly, Entebbe, *Maitland 197* (det. T. Petch).

51. *CORDYCEPS LLOYDII* Fawcett in Ann. Mag. Nat. Hist. ser. 5, xviii, p. 316 (1886). On an ant, *Gowdey* (ex C. G. Lloyd in Myc. Notes, p. 856; 1920).

52. *CORDYCEPS NUTANS* Pat. in Bull. Soc. Myc. France, iii, p. 127 (1887). On a Pentatomid bug, Namanvwe, *Maitland 195* (det. T. Petch).

53. *HYPOCRELLA JAVANICA* (Penz. & Sacc.) Petch in Ann. Roy. Bot. Gard. Perad. iv, p. 431 (1910). On a scale insect on a Rubiaceous plant, Butambala, *Hansford 1429*.

54. *HYPOCRELLA RACIBORSKII* Zimm. in Centralbl. f. Bakt. ser. 2, vii, p. 875 (1901). On a scale-insect on Coffee, Bwamba, *Hansford 1000* (leg. Hargreaves).

55. *EPICHLÖE CINEREA* Berk. & Broome in Journ. Linn. Soc. Lond. xiv, p. 111 (1873). On *Trichopteryx* sp., Entebbe Road, *Maitland 470*.

56. *EPICHLÖE SCHUMANNIANA* P. Henn., Pilze Ostafrikas, p. 32 (1895). On *Schizachryium* sp., Lumbwa, Kiagwe, *Dummer 3076*.

DOTHIDEACEAE.

1. *DOTHIDINA DISCIFORMIS* (Wint.) Theiss. & Syd. in Ann. Myc. xiii, p. 304 (1915). On *Myrica* sp., Gegede, *Dummer 2832* (det. Kew); Kigezi, *Hansford 2422* (leg. B. Tothill).

2. *AUERSWALDIA EXAMINANS* (Mont. & Berk.) Sacc., Syll. Fung. ii, p. 626. On bark, Mt. Elgon, *Small 135*.

3. *Diplochorella Fici* Hansford, sp. nov.

Stromata hypophylla, dispersa, maculis nullis, 200–350 μ diam., rugulosa, atra, discoidea, usque 200 μ alt., basi attenuata in mesophyllo immersa. *Loculi* 2–5 in parte superiore stromatis immersi, subglobosi, circa 100 μ diam. *Asci* 20–30, clavati vel cylindracei, aparaphysati, 8-spori, 50–60 $\times$ 12–15 μ . *Sporae* 2-seriatae, hyalinae, fusoideae, rectiusculae, 1-septatae, haud constrictae, 21–25 $\times$ 4–5 μ .

Hab. in foliis *Fici* sp., Kipayo, Dummer 1497.

The discoid stroma is attenuate below into a foot immersed in the mesophyll of the leaf; the upper surface is slightly rugulose owing to the loculi beneath. The upper part of the stroma consists of hard plectenchyma, but the base of the foot passes into a fibrillar structure penetrating through the leaf tissues.

4. *COCCODOTHELLA TRACHYLAENA* Syd. in Ann. Myc. xxxv, p. 268 (1937). On leaves of *Anthocleista* sp., Kampala, Hansford 1447.

5. *Leveillina ugandensis* Hansford, sp. nov.

Stromata epiphylla et caulicola, orbicularia vel irregularia, 1–4 mm. diam., atra, pulvinata, rugulosa, superficialia, 80–120 μ alt. *Loculi* numerosi, irregulariter dispositi, subglobosi vel lineari. *Asci* aparaphysati, clavati, 8-spori, 50–55 $\times$ 12–15 μ . *Sporae* dilute brunneae, ellipsoideae, 1-septatae, constrictae, cellulis subaequalibus, 14 $\times$ 5 μ , 2-seriatae. *Pycnidia* inter perithecia interspersa, consimilia; conidia bacillaria, 5–9 $\times$ 1 μ .

Hab. in foliis plantae ignotae, Mukono, Hansford 1435.

The arrangement of the loculi is variable, but usually there is an outer ring around each stroma. The stromata are easily detached from the leaf, leaving a shining black hypostroma in the leaf. The stroma is attached throughout its lower surface by minute hyphae through the cuticle, connecting with the hypostroma, which is at first limited to the epidermal cells, but later penetrates the mesophyll and occasionally forms a small ascostroma on the lower leaf-surface. Often the stromata are surrounded by a yellow zone of the leaf up to 1 mm. wide. The loculi are very variable in form and size, and open by a round pore or by an irregular longitudinal slit.

6. *CATACAUMA ELMERI* Syd. in Ann. Myc. xiii, p. 378 (1915). On *Ficus* sp. Kampala, Hansford 1313.

7. *CATACAUMA REPENS* (Corda) Theiss. & Syd. in Ann. Myc. xiii, p. 383 (1915). On *Ficus* sp., Kipayo, Dummer 917 (det. Kew).

8. *CATACAUMA ULCERATUM* (Mass.) Theiss. & Syd. in Ann. Myc. XIII, p. 399 (1915). On *Ficus ovata*, Kampala, *Small 17* (det. Kew).

9. *PHYLLACHORA AMANIENSIS* P. Henn. in Engl. Bot. Jahrb. XXXVIII, p. 113 (1905). On *Ficus* sp., *Dummer 4145* (det. Kew).

10. *PHYLLACHORA CHLORIDICOLA* Speg. in Myc. Arg. iv, no. 706; Sacc. Syll. XXII, p. 424. On *Chloris pycnothrix*, Kampala, *Hansford 882, 1023*; common.

11. *PHYLLACHORA CYNODONTIS* (Sacc.) Niessl., Not. Pyreno. p. 54. On *Cynodon dactylon*, Kampala, *Hansford 743*; Kigezi, *Hansford 931*; Serere, *Hansford 1027*; Karamoja, *Hansford 1465* (leg. Liebenberg); on *Sporobolus pyramidalis*, Kiagwe, *Hansford 905*; Kigezi, *Hansford 954*; Serere, *Hansford 1033*; Masindi, *Hansford 1216*; on *Leptochloa obtusiflora*, Tororo, *Hansford 998*.

12. *PHYLLACHORA CYPERINA* P. Henn., Fl. Bas et Moy. Congo, in Ann. Mus. du Congo, ser. 2, II, p. 98 (1907). On *Mariscus* sp., Kampala, *Hansford 1236*. On *Cyperus* sp., Kabale, *Hansford 2117*.

13. *PHYLLACHORA DAWEI* Massee in Kew Bull. 1908, p. 218. On *Ficus* sp., Buddu, *Dawe 290*.

14. *PHYLLACHORA DESMODII* P. Henn. in Engl. Pflanzenw. Ost-Afr. p. 34 (1895). On *Desmodium* sp., Lumbwa, Kiagwe, *Dummer 2841* (det. Kew); *Dummer 1485, 2501*; Kiagwe, *Hansford 1381*.

15. *PHYLLACHORA DIGITARIAE* Syd. in Bothalia, I, p. 220 (1929). On *Digitaria abyssinica*, Kigezi, *Hansford 932, 958, 993, 2203*; on *D. longiflora*, Mbarara, *Snowden 1406* (*Hansford 1401*); on *D. ternata*, Masindi, *Hansford 1210*; on *D. sp.*, Hoima, *Hansford 891*.

16. *PHYLLACHORA DOMBEYAE* (Syd.), Syd. in Ann. Myc. XIII, p. 532 (1915). On *Dombeya* sp., Mulange, *Dummer 4167*; Entebbe Road, *Hansford 2369*.

17. *PHYLLACHORA ELEUSINES* Speg., Myc. Arg. II, p. 75 (1902). On *Eleusine coracana*, Kakumiro, *Small 592*; Kigezi, *Hansford 926*; on *E. indica*, Bukasa, *Maitland* (*Hansford 1007*); Kigezi, *Hansford 2216*.

18. *PHYLLACHORA EVANSII* Syd. in Ann. Myc. x, p. 40 (1912). On *Setaria rubiginosa*, Kampala, *Hansford 1407*.

19. *PHYLLACHORA GRAMINIS* (Pers.) Fuckel, Symb. Myc. p. 216. On *Panicum* sp., Naminyama, *Dummer 2889*.

20. *PHYLLACHORA GREWIAE* (Kalehbr.) Theiss. & Syd. in Ann. Myc. XIII, p. 530 (1915); on *Honckenya* sp., Entebbe Road, *Hansford 1851*.

21. *PHYLLACHORA HETEROSPORA* P. Henn. apud De Wilde-mann in Mission E. Laurent, iv, p. 362 (1907). On *Panicum maximum*, Kampala, *Hansford 744*; on *P. trichocludum*, Kampala, *Hansford 842, 1046*.

22. *PHYLLACHORA LEEAE* Koord. in Verh. k. Akad. Wetensch. Amsterdam, XIII, p. 182 (1907). On *Leea guineensis*, Masaka Road, *Hansford 1341*.

23. *Phyllachora Liebenbergii* Hansford, sp. nov.

Stromata amphigena, linearia, usque ad 10 mm. longa et 0.5–1 mm. lata, atra, pulvinata, sub-irregularia, rugulosa. *Loculi* numerosi, ampullacei. *Asci* cylindracei, breviter pedicellati, 8-spori, 90–110 $\times$ 13–15 μ . *Sporae* oblique 2-seriatae, continuae, leves, hyalinae, ellipsoideae, 14–17 $\times$ 7–9 μ .

Hab. in foliis *Ischaemi brachyatheri*, Karamoja, *Hansford 1467* (leg. Liebenberg).

24. *PHYLLACHORA MILLETTIAE* P. Henn. in Engl. Bot. Jahrb. XXVIII, p. 326 (1905). On *Craibia* sp., Serere, *Snowden 1979* (leg. Hancock).

25. *PHYLLACHORA PENNISETI* Syd. in Ann. Myc. XIII, p. 39 (1915). On *Pennisetum purpureum*, Kampala, *Hansford 773*; Hoima, *Hansford 877*; on *P. setosum*, *Dummer 1114*; on *P. trachyphyllum*, Kigezi, *Hansford 948*.

26. *PHYLLACHORA TRICHOLAENAE* P. Henn. in Engl. Bot. Jahrb. XXIII, p. 541 (1897). On *Rhynchelytrum roseum* (*Tricholaena rosea*), Hoima, *Hansford 883*; Kampala, *Hansford 896*; very common everywhere.

27. *PHYLLACHORA UGANDENSIS* Syd. in Ann. Myc. XXXV, p. 272 (1937). On *Pseudarthria Hookeri*, Kipayo, *Dummer 2499*; Gayaza, *Hansford 1172*.

28. *PHYLLACHORA* spp. indet. On *Cymbopogon* sp., Koja, *Hansford 870*; on *Brachiaria* sp., Mt. Debasien, *Hansford 1996* (leg. A. S. Thomas); on *Eragrostis* sp., Kigezi, *Hansford 959*; on *Mariscus* sp., Kigezi, *Hansford 941*; on *Miscanthidium flavescens*, Budama, *Snowden 1260* (*Hansford 1373*); on *Panicum* sp., Kampala, *Hansford 898*; on *Panicum deustum*, Ankole, *Snowden 1373*; on *Phoenix reclinata*, Kipayo, *Dummer 922*; on *Vigna* sp., Masindi, *Hansford 1218*.

29. *PHAEODOTHIS STENOSTOMA* (Ell. & Tracy) Theiss. & Syd. in Ann. Myc. XIII, p. 596 (1915). On *Brachiaria brizantha*, Kampala, *Hansford 742, 843, 895*; Busoga, *Hansford 1014*; Serere, *Hansford 1036*.

30. *PHRAGMOCAUMA VIVENTIS* (Cooke) Theiss. & Syd. in Ann. Myc. xiii, p. 411 (1915). On *Albizzia zygia*, Dummer 3059, 3952; Entebbe Road, Hansford 1287; Kampala, Hansford 2335.

MYRIANGIACEAE.

1. *Elsinoe Adeniae* Hansford, sp. nov.

Scabies amphigenae, petiolicolae et caulicolae, orbiculares vel irregulares, luteae, 0.5–1.5 mm. diam., vel in confluendo longiores, pulvinatae. *Ascomata* sparsa, orbicularia, circa 60 μ diam. *Asci* 6–8 sub epithecio pseudoparenchymatico dilute olivaceo immersi, globosi vel ovati, circa 18 μ diam., 8-spori. *Sporae* hyalinae (? in maturitate olivaceae), ellipsoideae, 3-septatae, in medio leniter constrictae, leves, circa 16 $\times$ 7 μ , parte superiore crassiores; cellulae majores longitudinaliter 1-septatae.

Hab. in foliis, petiolis et caulibus *Adeniae* sp., Entebbe Road, Hansford 2459 (leg. P. Chandler).

The lesions are light buff, often confluent along the petioles and the main veins of the leaves, somewhat warted and corky, causing distortion of leaves and petioles. The ascomata are small and scattered over the lesions.

2. *Elsinoe Antiaridis* Hansford, sp. nov.

Scabies amphigenae, luteo-griseae, margine brunneae, 0.5–3 mm. diam. lenissime pulvinatae, leves. *Mycelium* sub cuticula folii, hyalinum, pseudoparenchymatum. *Ascomata* sparsa, 100–150 μ diam., pulvinatula. *Asci* sub epithecio pseudoparenchymatico dilute olivaceo immersi, ellipsoidei vel globosi, 8-spori, 14–18 μ diam. *Sporae* conglobatae, 3-septatae vel muriformes, leves, dilute olivaceae, in medio leniter constrictae, parte superiore crassiores, 11–14 $\times$ 4.5–6 μ .

Hab. in foliis *Antiaridis toxicariae*, Entebbe Road, Hansford 2360.

3. *ELSINOE CANAVALIAE* Rac., Parasit. Algen. u. Pilze Javas, I, p. 14 (1900). On *Canavalia ensiformis*, Serere and Kampala, Hansford 1780, 2109, 2113; ? on *Dolichos Lablab*, Serere, 1932, Hansford !

4. *Elsinoe Chandleri* Hansford, sp. nov.

Scabies amphigenae, petiolicolae et caulicolae, saepe numerosissimae, orbiculares vel irregulares, luteae vel sub-albae, pulvinatae, rugulosae, usque ad 5 mm. diam., saepe confluentes et majores. *Ascomata* sparsa vel confluentia, 60–100 μ diam., orbicularia. *Asci* numerosi, sub epithecio pseudoparenchymatico dilute olivaceo immersi, globosi vel ovati, circa

20 μ alt. et 12–20 μ diam., 8-spori. *Sporae* conglobatae, ellipsoideae, hyalinae vel dilute olivaceae, 3-septatae vel muriformes, leves, in medio leniter constrictae, 14–17 $\times$ 5–6 μ , parte superiore crassiores.

Hab. in foliis petiolis et caulibus *Mikaniae scandentis*, Entebbe Road, *Hansford 2458* (leg. P. Chandler).

Causes much deformation of all parts attacked; lesions very numerous, light yellowish to almost white.

5. **ELSINOE FAWCETTII** Bitancourt & Jenkins in *Phytopath.* xxvi, p. 394 (1936). On *Citrus* spp., Kampala, *Hansford 1803*, etc. The West Indian Lime (*C. aurantiifolia*) appears to be the most susceptible *Citrus* at Kampala, though other species are attacked. Hitherto only the conidial stage has been found in Uganda.

6. **Elsinoe Piperis** Hansford, sp. nov.

Scabies plerumque hypophyllae, pulvinatae, 1–3 mm. diam., luteae vel griseae, primo superficie purpureo-farinaceae. *Mycelium* sub cuticula folii; hyphae hyalinae, ramosissimae, septatae, pseudoparenchymam efformantes. *Asci* sparsi, sub epithecio dilute olivaceo pseudoparenchymato immersi, globosi vel ovati, 20–27 μ diam., 8-spori. *Sporae* conglobatae, oblongo-ellipsoideae, 13–15 $\times$ 4.5–6 μ , primo 3-septatae hyalinae demum cellulae majores longitudinaliter 1-septatae dilute olivaceae, leves, in medio leniter constrictae, parte superiore crassiores.

Hab. in foliis *Piperis capensis*, Lake Nabugabo, Masaka, *Hansford 2121* (leg. P. Chandler); Entebbe Road, *Hansford 2352, 2361*; Kiagwe, *Hansford 1434 p.p.*

7. **ELSINOE TEPHROSIAE** Hansford in *Ann. Rep. Dep. Agric. Uganda*, for 1936, p. 49 (1938).

Lesions slightly raised and soon presenting a corky surface, on leaves, petioles and branches; on the leaves minute up to 1 mm. long; on the petioles linear up to 3 mm.; on stems often confluent over large areas. Conidia minute, ovate, formed on young lesions on very short erect conidiophores, evanescent. *Asci* produced below the light olivaceous pseudoparenchymatous epithecium, usually scattered but sometimes in rounded ascomata about 100 μ diam., globose, 18–23 μ diam., 8-spored. Spores hyaline, finally light brown, ellipsoid, constricted in the middle, with 3–4 cross-septa and a single longitudinal septum in the larger cells; upper half slightly broader, 13–15 $\times$ 6–7 μ . The mycelium is sub-cuticular and forms almost a solid membrane of cells.

On *Tephrosia candida*, Kampala, *Hansford 1894, 1904*.

8. *Elsinoe Tylophorae* Hansford, sp. nov.

Scabies luteae vel dilute brunneae, irregulares amphigenae, rugulosae, leniter pulvinatae. *Ascomata* sparsa, orbicularia, circa 100μ diam., vel confluentia. *Asci* numerosi, sub epithecio dilute olivaceo pseudoparenchymatico immersi, globosi vel ovati, circa 20μ diam., 8-spori. *Sporae* conglobatae, hyalinae, 3-septatae vel muriformes, in medio leniter constrictae, parte superiore crassiores, $13-15 \times 5-6\mu$.

Hab. in foliis *Tylophorae* sp., Bukasa Rifle Range, Kiagwe, Hansford 2430.

The lesions often follow the main veins and are confluent along these.

9. *Elsinoe ugandensis* Hansford, sp. nov.

Scabies amphigenae, sub-albae vel luteae, pulvinatae, rugulosae, saepe confluentes et plus minusve effusae. *Asci* sparsi vel rarius in ascomatibus aggregati, sub epithecio sub-hyalino pseudoparenchymatico immersi, ovati vel globosi, $30-35 \times 18-25\mu$, 8-spori. *Sporae* conglobatae, hyalinae (? in maturitate olivaceae), ellipsoideae, 3-septatae, demum muriformes, in medio constrictae, leves, parte superiore crassiores, $12-14 \times 5-6\mu$.

Hab. in foliis *Pseudospondiadis microcarpae*, Entebbe Road, Hansford 2375.

The lesions are irregularly confluent over large areas of the leaf, and when young are covered with a purplish-white bloom of conidiophores and conidia (*Sphaceloma* stage). Later they become pale buff to almost white and cause considerable distortion of the leaves. The epithecium is less developed than in some other species of the genus and in most cases the asci are scattered over the lesion and not aggregated into definite ascomata. Like those of many other species of *Elsinoe*, the spores are very refractive.

10. *Elsinoe Urerae* Hansford, sp. nov.

Scabies hypophyllae, luteo-griseae, 3-5 mm. diam., orbiculares, pulvinatae. *Mycelium* ex hyphis hyalinis septatis ramosissimis sub-cuticularibus compositum. *Ascomata* $60-100\mu$ diam. *Asci* numerosi, sub epithecio dilute olivaceo pseudoparenchymatico immersi, globosi, circa 20μ diam. conglobatae, hyalinae, demum dilute olivaceae, muriformes, in medio constrictae, parte superiore crassiores, $13-18 \times 5-7\mu$.

Hab. in foliis *Urerae camerunensis*, Entebbe Road, Hansford 2359.

11. *ELSINOE* sp. *Hansford 2466* (*Chandler 2535*), on *Stereospermum Kunthianum*, Botanic Gardens, Entebbe, shows only the mycelium; no conidia or asci present.

12. *MYRIANGIUM DURIAEI* Mont. & Berk. in Hooker's London Journ. Bot. 1845, p. 73. On scale-insects on *Citrus*, Kampala, *Hansford 1153*; on *Aspidotus* sp. on cultivated roses, Kampala, *Hansford 1901*; on scale-insects on *Tephrosia candida*, Kampala, *Hansford 2039*.

13. *Uleomyces Tetracerae*, Hansford, sp. nov.

Stromata primo in foliis immersa, atra, 200–250 μ diam., prosenchymatica, demum epidermidem superiorem folii disrumpentia et pulvinum parenchymaticum rubro-brunneum 0.5 mm. diam. et 150 μ alt. efformantia. *Asci* in pulvino externo immersi, 2-seriati, ovati vel globosi, 30–38 $\times$ 20–30 μ 4–6–8-spori. *Sporae* conglobatae, ellipsoideae, in medio constrictae, muriformes, hyalinae, leves, 20–24 $\times$ 7–9 μ .

Hab. in foliis *Tetracerae potatoriae*, Salama, Kiagwe, *Dummer 2511* (typus); Entebbe Road, *Hansford 2323*; Rifle Range, Kiagwe, *Hansford 2447*.

POLYSTOMELLACEAE.

1. *DIPLOCARPON ROSAE* Wolf in Bot. Gaz. LIV, p. 231 (1912). On cultivated roses, Kampala, *Small 484*; *Hansford*!

2. *COCCONIA CONCENTRICA* (Syd.) Syd. in Ann. Myc. XIII, p. 215 (1915). On *Bersama* sp., Masaka Road, *Hansford 1783 p.p.*; Entebbe Road, *Hansford 1948 p.p.*; on *Carapa* sp., Entebbe Road, *Hansford 2269*; on *Trichilia* sp., Entebbe Road, *Hansford 2390*.

3. *HYSTEROSTOMELLA TETRACERAE* (Rud.) v. Hoehnel, Fragm. z. Mykol. IX, no. 465. On *Tetracera potatoria*, Entebbe Road, *Hansford 1462*.

(4. *ASTERODOTHIS SOLARIS* (Kalchbr. & Cooke) Theiss. in Ann. Myc. x, p. 179 (1912). The locality is given as 'Uganda', but the collection was made by Scheffler at Limuru, Kenya.)

MICROTHYRIACEAE.

1. *ASTERINA ARTABOTRYDIS* Hansford in Ann. Myc. XXXVI, p. 194 (1938). On *Artabotrys* sp., Entebbe Road, *Hansford 1442, 2314*.

2. *ASTERINA ATERRIMA* Syd. in Ann. Myc. XXXVI, p. 170 (1938). On *Oxyanthus* sp., Entebbe Road, *Hansford 2304*.

3. *ASTERINA* (ENGLERULASTER) *AULICA* Syd. in Ann. Myc. XXXVI, p. 185 (1938). On *Oncinotis* sp., Entebbe Road, *Hansford 1951, 2274*.

153 SESS. (1940²-1).

4. *ASTERINA BLANDA* Syd. in Ann. Myc. xxxvi, p. 171 (1938). On *Motandra* sp., Entebbe Road, *Hansford* 1840; Kampala, *Hansford* 1883.

5. *ASTERINA CAPPARIDIS* Syd. & Butl. in Ann. Myc. ix, 390 (1911). On *Capparis* sp., Kazi, Kampala, *Hansford* 1922; on *Maerua angolensis*, Ankole, *Hansford* 2082.

6. *ASTERINA CLERODENDRICOLA* Hansford in Ann. Myc. xxxvi, p. 195 (1938). On *Clerodendron capitatum*, Kiagwe, *Hansford* 1358; Entebbe Road, *Hansford* 1844.

7. *ASTERINA COMBRETI* Syd. in Engl. Bot. Jahrb. xlv, 1910, p. 264. On *Combretum* sp., Masaka Road, *Hansford* 2254; Entebbe Road, *Hansford* 1874, 2291, 2363, 2388.

8. *ASTERINA DIPLOCARPA* Cooke in Grevillea, x, p. 129 (1882). On *Sida rhombifolia*, Kampala, *Hansford* 1080; Kiagwe, *Hansford* 1985; common everywhere.

9. *ASTERINA ELACHISTA* Syd. in Ann. Myc. xxxvi, p. 173 (1938). On *Piper* sp., Entebbe Road, *Hansford* 2103.

10. *ASTERINA ERYSIPOIDES* Kalchbr. & Cooke in Grevillea, ix, p. 32 (1880). On unknown host, Masaka Road, *Hansford* 1340.

11. *ASTERINA FUNTUMIAE* Syd. in Ann. Myc. xxxvi, p. 174 (1938). On *Funtumia elastica*, Butambala, *Hansford* 1408; Kiagwe, *Hansford* 1433.

These specimens differ from Sydow's description only in longer spores, $22-29 \times 10-12.5 \mu$.

12. *Asterina* (*Englerulaster*) *Geniospori* comb. nov., Hansford as *Englerulaster* in Ann. Myc. xxxvi, p. 197 (1938). On *Geniosporum paludosum*, Bombo Road, *Hansford* 1795.

13. *ASTERINA HANSFORDII* Syd. in Ann. Myc. xxxvi, p. 175 (1938). On *Pittosporum abyssinicum*, Entebbe Road, *Hansford* 2278, 2289.

14. *ASTERINA HAPALA* Syd. in Ann. Myc. xxxvi, p. 176 (1938). On *Hugonia platysepala*, Entebbe Road, *Hansford* 2277.

15. *Asterina kampalensis* Hansford, sp. nov.

Plagulae epiphyllae, effusae, tenues, atro-brunneae, usque ad 5 mm. diam., subinde plus minusve confluentes et majores. *Mycelium* ex hyphis dilute brunneis subrectis $4-4.5 \mu$ crassius septatis (articulis $25-35 \mu$ longis) oppositè ramosis anastomosantibus compositum. *Hyphopodia* plerumque opposita, recta vel curvata, 1-septata, cellula basali cylindracea $2-3 \mu$

longa, cellula apicali irregulariter lobata $8-12 \times 5-8 \mu$. *Thyrothecia* dense dispersa $100-160 \mu$ diam., margine fimbriata, strato tegenti leniter convexulo in parte centrali e cellulis cubicis circa 4μ diam. metientibus in maturitate laciniis triangularibus irregulariter stellatim dehiscenti. *Asci* globosi vel late ellipsoidei, sessiles vel brevissime noduloseque stipitati, paraphysati, $24-33 \mu$ diam., 4-8-spori. *Sporae* conglobatae, brunneae, oblongae vel ellipsoideae, utrinque late rotundatae circa medium septatae constrictae, granulosa, $16-20 \times 8-10 \mu$. *Pycnidia* thyrotheciis similia; conidia ovata vel piriformia, atro-brunnea, $15-19 \times 7-9 \mu$, zonula hyalina praedita.

Hab. in foliis *Alchorneae cordifoliae*, Masaka Road, *Hansford 1347, 1782*; Butambala, *Hansford 1347*.

This differs from *A. Alchorneae* Syd., on the same host in Sierra Leone, in that the hyphopodia are mostly opposite, often almost uncinata, the spores are longer, and often very slightly roughened on the surface.

16. *ASTERINA NYANZAE* Hansford in Ann. Myc. xxxvi, p. 195 (1938). On *Grewia* sp., Entebbe Road, *Hansford 1288*; Ankole, *Hansford 2138*.

17. *ASTERINA PYCNANTHI* Hansford in Ann. Myc. xxxvi, p. 196 (1938). On *Pycnanthus Schweinfurthii*, Entebbe, *Hansford 1352* (leg. Snowden); *Hansford 2280*.

18. *ASTERINA SCITULA* Syd. in Ann. Myc. xxxvi, p. 183 (1938). On *Crotalaria* sp., Entebbe Road, *Hansford 2098*; Kigezi, *Hansford 2179*.

19. *ASTERINA SCRUPOSA* Syd. in Ann. Myc. xxxvi, p. 184 (1938). On *Tetracera potatoria*, Entebbe Road, *Hansford 1942*.

20. *ASTERINA SOLANICOLA* Berk. & Curt. in Journ. Linn. Soc. Lond. x, p. 374 (1869). ? On *Triumfetta* sp., Masaka Road, *Hansford 1348*.

21. *ASTERINA SPONIAE* Racib., Parasit. Algen u. Pilze Javas, III, p. 34 (1900). On *Trema guineense*, Entebbe Road, *Hansford 2268*.

22. *ASTERINA TENUIS* Wint. in Hedwigia, 1886, p. 94. On *Acalypha* sp., Kampala, *Hansford 755*; Nakifuma, *Hansford 1198*; Jinja Road, *Hansford 1393, 1432, 2438*; Masaka Road, *Hansford 1791, 1999*.

23. *ASTERINA TERTIA* Rac., var. *AFRICANA* Doidge in Trans. Roy. Soc. S. Afr. VIII, p. 264 (1920). On *Acanthacea* sp., Mukono, *Hansford*; 1353 on *Barleria* sp., Lake Nabugabo, Masaka, *Hansford 2134* (leg. P. Chandler); on *Justicia* sp., Kazi, Kampala, *Hansford 2021*.

24. *ASTERINA TRICHILIAE* Doidge in Trans. Roy. Soc. S. Afr. VIII, p. 253 (1920). On *Bersama* sp., Masaka Road, *Hansford 1783 p.p.*; Entebbe Road, *Hansford 1948 p.p.*

25. *ASTERINA UGANDENSIS* Syd. in Ann. Myc. XXXV, p. 274 (1937). On *Turraea Vogelii*, Masaka Road, *Hansford 2011*; Entebbe Road, *Hansford 2460*.

26. *Asterinella ugandensis* Hansford, sp. nov.

Plagulae amphigenae, densae, atrae, orbiculares, usque ad 2 mm. diam., laxe dispersae vel confluentes. *Mycelium* ex hyphis exhyphopodiatis brunneis septatis $4-5\mu$ crassis oppositè ramosis anastomosantibus reticulatis compositum. *Thyrothecia* orbicularia, dense disposita, saepe confluentia irregulariaque, margine non fimbriata, usque ad 150μ diam.; membrana basali indistincta tenui subhyalina, strato tegenti convexulo ex hyphis radiantibus $3.5-4\mu$ crassis composito, cellulis in parte centrali $4-6\mu$ longis stellatim dehiscentibus. *Asci* numerosi, ovati vel late ellipsoidei, sessiles, 8-spori, usque ad $35 \times 22\mu$. Paraphyses paucae, sparsae, flexuoso-filiformes, rarius furcatae. *Sporae* ellipsoideae, conglobatae, hyalino-brunnescentes, leves, 1-septatae, constrictae, $15-18 \times 6-7.5\mu$, cellulae superiores crassiores.

Hab. in foliis *Rubiacearum* sp. indet., Entebbe Road, *Hansford 2457*.

27. *Lembosia microcarpae* Hansford, sp. nov.

Plagulae plerumque epiphyllae, densae, subcrustosae, atrae, usque ad 3 mm. diam. *Mycelium* ex hyphis rectis radiantibus brunneis $5-6\mu$ crassis septatis (articulis $15-25\mu$ longis) ramosis anastomosantibus dense reticulatis compositum. *Hyphopodia* unilateralia vel alternata vel rarissime opposita, continua, clavata, $11-14 \times 6.5-9\mu$. *Thyrothecia* atra, densissime disposita, irregulariter elongato-ellipsoidea, convexula, $300-800 \times 300-600\mu$, saepe curvata, primum omnino clausa, demum longitudinaliter disrumpentia vel rarius sub-stellatim dehiscentia. *Asci* numerosi, ovati, aparaphysati, 8-spori sessiles, circa $60 \times 40\mu$. *Sporae* conglobatae, atro-brunneae, saepe utrinque pallidiores, leves, 1-septatae, constrictae, $30-32 \times 13-15\mu$.

Hab. in foliis *Pseudospondiadis microcarpae*, Kiagwe, *Hansford 1359*.

28. *LEMBOSIA HOLOMELA* Syd. in Ann. Myc. XXXVII, p. 234 (1939). On *Scutia myrtina*, Rifle Range, Kiagwe, *Hansford 2436*.

MICROPELTACEAE.

1. *Dictyopeltis entebbeensis* Hansford, sp. nov.

Mycelium nullum. *Scutella* amphigena, superficialia, atro-viridia, versus marginem pallidiora, convexula, 400–500 μ diam., irregulariter stellatim disrumpentia. *Asci* numerosi, aparaphysati, ovati vel globosi, 8-spori, 50–60 $\times$ 40–47 μ . *Sporae* conglobatae, hyalinae, ellipsoideae, 1-septatae, constrictae, 39–48 $\times$ 10–14 μ , cellula superiori crassiores; paries mox mucosus.

Hab. in foliis *Pseudospondiadis microcarpae*, Entebbe, Hansford 1355 p.p. (leg. Snowden); in foliis *Hugoniae platysepalae*, Entebbe, Hansford 1384; in foliis *Canthii zanzibarici*, Maitland s.n., Buvuma, Nov. 1925.

2. MICROPELTIS CORYNESPORA Sacc. in Bull. Soc. Broteriana, XXI, p. 6 (1906). On *Pseudospondias microcarpa*, Entebbe, Hansford 1355 p.p. (leg. Snowden); on unknown host, Kazi, Kampala, Hansford 1914.

The latter specimen has rather larger spores, 60–70 $\times$ 8–10 μ .

3. *Micropeltella Alchorneae* Hansford, sp. nov.

Mycelium nullum. *Scutella* convexula, superficialia, plerumque epiphylla, atro-viridia, 200–400 μ diam. *Asci* numerosi, clavato-cylindracei, 4–8-spori, 120–160 $\times$ 20–25 μ , paraphysati. *Sporae* parallelae, clavatae, hyalinae, 2–(3)-septatae, constrictae, cellula superiore majore, versus basim attenuatae, 40–45 $\times$ 10–15 μ .

Hab. in foliis *Alchorneae cordifoliae*, Butambala, Hansford 1369.

The outer walls become gelatinous in ripe spores.

4. *Micropeltella Funtumiae* Hansford, sp. nov.

Mycelium nullum. *Scutella* superficialia, 600–800 μ diam., atro-viridia, versus marginem pallidiora, glabra, strato tegente convexulo ex hyphis reticulatis 4 μ crassis composito at dehiscence centrali irregulariter stellato. *Asci* late ellipsoidei, 120–160 $\times$ 25–35 μ , 2–4-spori, aparaphysati. *Sporae* hyalinae, elongato-clavatae vel cylindraceae vel fusoideae, utrinque rotundatae, curvulae, 3–7-septatae, constrictae, 85–120 $\times$ 10–18 μ .

Hab. in foliis *Funtumiae elasticae*, Butambala, Hansford 1423.

The asci at first form eight spores, of which, as a rule, only two to four develop to maturity; mature spores are very variable in size and septation, and have gelatinous walls.

5. *Micropeltella Maitlandii* Hansford, sp. nov.

Mycelium nullum. *Scutella* superficialia, 250–350 μ diam., atro-viridia, versus marginem sub-hyalina, glabra, strato

tegenti convexulo reticulato ex hyphis 2–3 μ crassis composito. *Asci* numerosi, late clavati vel ellipsoidei, 8-spori, circa $60 \times 25\text{--}35 \mu$, basi attenuati vel pedicellati, aparaphysati. *Sporae* hyalinae, clavatae, 5–7-septatae, leniter constrictae, $35\text{--}40 \times 7\text{--}8 \mu$.

Hab. in foliis *Canthii* sp., Masaka Road, *Hansford* 1325 a; in foliis *Pavettae Baconiae*, Katera Forest, *Maitland* 868; in foliis *Apocynacearum* sp., Entebbe Road, *Hansford* 1853 p.p.

6. *Micropeltis Ugandae* Hansford, sp. nov.

Mycelium nullum. *Scutella* orbicularia, superficialia, 500–1000 μ diam., atro-viridia, strato tegente convexulo ex hyphis reticulatis 2–5–3 μ crassis composito at irregulariter stellatim dehiscenti. *Asci* numerosi, cylindraceo-clavati, sub-pedicellati, $150\text{--}200 \times 30\text{--}40 \mu$, 8-spori; paraphyses filiformes, indistinctae sub-mucosae. *Sporae* cylindraceae vel leniter clavatae, hyalinae, 2-septatae, constrictae, parallelae, $100\text{--}150 \times 12\text{--}17 \mu$.

Hab. in foliis *Canthii* sp., Masaka Road, *Hansford* 1325 p.p.; *Euphorbiacearum* sp., Kiagwe, *Hansford* 1381 p.p.; *Oxyanthi* sp., Entebbe, *Maitland* s.n., 1922; *Uncariae africanae*, Entebbe, *Maitland* s.n., 1922; *Funtumiae elasticae*, Butambala, *Hansford* 1408 p.p.; *Bersamae* sp., Entebbe Road, *Hansford* 1850 p.p.

The mature spores usually break up into single cells with thick mucose walls.

7. *Micropeltella macrospora* Hansford, sp. nov.

Mycelium nullum. *Scutella* orbicularia, atro-viridia, 750–900 μ diam., superficialia, strato tegente convexulo (–200 μ alt.) glabro ex hyphis reticulatis 4–5 μ crassis composito. *Asci* numerosi, cylindraceo-ellipsoidei, breviter pedicellati, $140\text{--}190 \times 25\text{--}35 \mu$, 2–4-spori, aparaphysati. *Sporae* fusioideae, curvulae, hyalinae, leves, utrinque rotundatae, 12–17-septatae, $120\text{--}150 \times 16\text{--}24 \mu$.

Hab. in foliis *Funtumiae elasticae*, Butambala, *Hansford* 1424.

The walls of the mature spores are thickened and gelatinous, 5–6 μ thick.

8. *SCOLECOPELTIS BAKERI* Syd. in Ann. Myc. xv, p. 232 (1917). On *Pseudospondias microcarpa*, Entebbe, *Hansford* 1355 p.p.; on *Landolphia* sp., Jinja Road, *Hansford* 1391 p.p., Entebbe Road, *Hansford* 1853, p.p.; on *Bersama* sp., Entebbe Road, *Hansford* 1850 p.p.

9. *Microthyriella Chandleri* Hansford, sp. nov.

Plagulae epiphyllae, orbiculares vel irregulares, tenues, brunneae, usque ad 4 mm. diam. vel in confluento majores. *Mycelium* ex hyphis undulatis ramosissimis brunneis reticulatis 1–2 μ crassis indistincte septatis superficialibus compositum.

Scutella laxa dispersa, atro-brunnea, orbicularia, usque ad 200μ diam., superficialia; strato tegente ex hyphis $2-3\mu$ crassis dense reticulatis composito irregulariter stellatim dehiscente. *Asci* sphaeroides, 8-spori, circa 15μ diam., paraphysati. *Sporae* conglobatae, hyalinae, leves, ellipsoideae, 8-septatae, leniter constrictae, $8-11\mu$ longae, cellula superiore $3.5-4\mu$ diam. subglobosa, cellula inferiore $2.5-3\mu$ crassa.

Hab. in foliis *Lonchocarp*i sp., Entebbe Botanic Garden, Chandler (Hansford 2467).

The mycelium forms a delicate pellicle over the cuticle of the host, hardly visible to the naked eye.

10. *MICROTHYRIELLA SCABRELLA* Syd. in Ann. Myc. xxxv, p. 273 (1937). On *Bridelia micrantha*, Kampala, Hansford 1079 p.p.

11. *Microthyriella gigantospora* Hansford, sp. nov.

Mycelium nullum. *Scutella* atro-brunnea, glabra, $500-1250\mu$ diam., laxa dispersa, superficialia; strato tegente ex hyphis reticulatis brunneis 4μ crassis composito. *Asci* ovati, paraphysati, 8-spori, circa $130 \times 35\mu$, basi noduloso-pedicellati. *Sporae* parallelae, fusioideae, curvulae, utrinque rotundatae, hyalinae, 1-septatae, leniter constrictae, $60-85 \times 15-17\mu$.

Hab. in foliis *Funtumia*e *elasticae*, Butambala, Hansford 1421.

The asci and spore measurements much resemble those of *Dictyothyrium giganteum* Syd., but the scutella are much larger, brown (not blue-black), and there are no paraphyses.

12. *Schizothyrium Snowdenii* Hansford, sp. nov.

Plagulae epiphyllae, effusae, tenuissimae, brunneae. *Mycelium* ex hyphis brunneis ramosissimis anastomosantibus septatis $2-3\mu$ crassis exhyphopodiatis compositum. *Scutella* dispersa, linearia, atro-brunnea, glabra, $200-300 \times 50-80\mu$, recta vel curvula, rarius ramosa, convexula, radiata, aperta longitudinaliter disrumpentia. *Asci* ovati, 8-spori, paraphysati, $25-31 \times 20-24\mu$. *Sporae* maturae non visae.

Hab. in foliis *Euphorbiacearum* sp. indet., Kampala, Hansford 1382 (leg. Snowden).

13. *APHYSA RHYNCHOSIAE* (Kalchbr. & Cooke) Theiss. & Syd. in Ann. Myc. xv, p. 134 (1917). Syn. *Parodiella Schimper*i P. Henn. On *Glycine* and *Rhynchosia* spp., Dummer 2880, 1489, 3921; Hansford 2331.

14. *APHYSA UGANDENSIS* Syd. in Ann. Myc. xxxv, p. 270 (1937). On *Eriosema* sp., Kipayo, Dummer 2322; Masaka Road, Hansford 2033.

15. *Saccardinula Canthii* Hansford, sp. nov.

Mycelium nullum. *Scutella* laxè dispersa superficialia, orbicularia, 180–250 μ diam., brunnea, versus marginem pallidiora, strato tegente ex hyphis reticulatis 3 μ crassis composito. *Asci* paraphysati, 8-spori, ovati, numerosi. *Sporae* hyalinae, cylindraceae, utrinque rotundatae, muriformes, 10–13-septatae, leniter constrictae, leves, curvulae, 50–75 $\times$ 12–15 μ .

Hab. in foliis *Canthii vulgaris*, Mulange, *Dummer 4426*.

The spores as described above may be immature; in mass they are light pink.

16. *DICTYOPELTIS CONSIMILIS* Syd. in Ann. Myc. xxxvi, p. 192 (1938). On *Balsamocitrus* sp., Kampala, *Hansford 2074* (leg. *Chandler*).

I have to acknowledge the great assistance received from Mr. E. W. Mason, Dr. S. P. Wiltshire and Dr. G. R. Bisby in the identification of many of the fungi included in this paper.

The specimens enumerated in the paper are all preserved at the Herbarium of the Royal Botanic Gardens at Kew or in the Herbarium of the Imperial Mycological Institute. Duplicates of some specimens are also at the Herbarium of the East African Agricultural Research Station, Amani.

A REVISION OF THE AUSTRALIAN SPECIES OF ENNEAPOGON DESV.

BY NANCY TYSON BURBIDGE.

THIS revision is based on material available at the Kew Herbarium, where, in addition to the specimens quoted by Bentham (*Flora Austral.* vii, p. 600; 1878) and collections sent from various parts of Australia since that time—particularly from Queensland and Central Australia (the latter from Professor J. B. Cleland)—there were also, on loan, specimens from Prague collected by Domin in Queensland, and from Cambridge Lindley's type-specimens collected by Mitchell, as well as the Queensland collections of C. E. Hubbard made in 1930–31, material from the State Herbarium, Western Australia, presented to Kew by C. A. Gardner in 1938, and from the Herbarium of the Institute of Agriculture, University of Western Australia. This last material, duplicates of which have been presented to Kew, was brought from Western Australia by the author. New South Wales is poorly represented at Kew in this genus, but owing to the outbreak of war no further material could be obtained. The war was also

responsible for the evacuation of Robert Brown's type-material from the British Museum before it had been properly studied. So that, throughout this paper, references made to his material are founded on the portions of his types which are at Kew. Apart from this, the original type-material of all species has been studied. The rest of the *Enneapogon* material at the British Museum has been studied and is listed herein.

GEOGRAPHIC DISTRIBUTION.—*Enneapogon* Desv. is the most dispersed genus in the tribe Pappophoreae, and the only one to occur in Australia. It is practically confined to the northern portion of the continent and the drier regions of the southern interior, except for *E. nigricans* which has a markedly southern distribution. Only two species have, up to the present, been accurately reported from Victoria and none from Tasmania. These areas are too damp and cold, and the reason for absence of specimens is geographic and climatic. Climate plays a leading rôle in the distribution of plants throughout the Australian continent since, broadly speaking, there are few physiographic features of great importance. So far as *Enneapogon* is concerned distribution is as follows:—*E. nigricans*, as has been said, is a southern form, and occurs in a narrow band from the Swan River around the south coast to Sydney and the Queensland border; north of this, in Western Australia, *E. caeruleascens* is found from Roebourne and Sharks Bay through the 'Mulga' country (i.e. Semi-desert Acacia Scrub) to similar country in the Flinders Range in South Australia; *E. cylindricus* occurs in the same area, but has a more restricted distribution according to present records. In northern New South Wales and southern Queensland *E. flavesceus* is associated with the black soils. The rest of the species are confined to the northern half of the continent, the bulk of them being found in Queensland, except *E. avenaceus* and *E. polyphyllus*, which are widespread in the drier areas of the whole continent. Of the tropical group, *E. planifolius* and *E. glaber* are found in northern Western Australia, while *E. pallidus*, *E. purpurascens* and *E. pubescens* occur in northern Queensland, as do others that need not be enumerated here. *E. Lindleyanus* and *E. oblongus* are reported from various places extending from Dampier Archipelago in the west to Townsville in the east.

The correlation of this distribution with the climate is as follows. The area of *E. nigricans* has its wet season during the winter, i.e. during the period May to September. *E. caeruleascens* and *E. cylindricus* receive either summer (December to February) or winter (May to July) rains. In good years both seasons may be wet; in drought years neither. It is an area of marked irregularity in annual precipitation. In the

east the situation is more complex, though again no one season is the rainy one. With *E. flavescens* the edaphic factor comes into play. With the tropical species the rainfall is of the summer type, and may occur any time between December and March.

The genus is also known from arid regions in Central and North America, Asia, northern, eastern and southern Africa, though the species are not the same as the Australian ones.

ECONOMIC VALUE IN AUSTRALIA.—This value is not very great. Many of the reports on fodder value are worthless owing to the confused condition of the genus. However, stock undoubtedly do feed on a number of species. It is the information as to which that is unreliable. For example, Maiden ('Manual Grasses N.S.W.' p. 142; 1898) says, under *Pappophorum nigricans* R. Br. 'a drought resisting species but not readily eaten by stock so far as my experience goes'. He then quotes Bailey; 'this is an erect grass, and although wiry in appearance, furnishes a good quantity of feed and bears close cropping; there are many forms of it, some of which would be worthy of cultivation as ornamental grasses'. There is no doubt that these remarks refer to more than one species. Speaking of *Enneapogon polyphyllus*, Koch says 'a useful grass'. Similar information has been received from the manager of Noonkanbah Station, West Kimberley, so that this widespread grass is probably one of the most important species in several respects. Koch also regarded *E. caerulea* (collected under the same number as *E. polyphyllus*) as good fodder, and this species has been observed, close cropped by sheep, at Glenorn Station, Malcolm, by the author. It is also reported as 'fair feed' by Meares from Warambie Station, Roebourne. Connor reports that the Kimberley species *E. glaber*, which is an annual, is good fodder while it lasts. This is in cattle country having summer rains. Reports concerning *E. avenaceus* are conflicting. Gooch reports it as 'good stock fodder' at Wandagee Station, Minilya River, in Western Australia, whereas Hubbard says that it did not appear to be fed upon in Queensland.

The variability and irregularity of rainfall in Central Australia, where so many species of *Enneapogon* occur, probably accounts for some of them behaving as either annuals or perennials. *E. polyphyllus* and *E. caerulea* are examples of this. Since young regrowth in most grasses is palatable to stock, the ability to sprout after rain, at whatever season of the year it may fall, is interesting from the fodder point of view.

Bailey ('Grasses of Queensland', p. 34; 1878) says that *E. purpurascens* (quoted as *Pappophorum purpurascens* R. Br.)

is well spoken of in the western districts—i.e. of Queensland—where the stock fatten on the young growth. There are no specimens at Kew of this species from southern or western Queensland, and it is, therefore, doubtful which species is meant.

Cleland reports that various species are utilized by the aborigines: for instance *Enneapogon Clelandii* is used to strain debris from drinking water; *E. avenaceus* and *E. polyphyllus* provide a certain amount of food, as their seeds are found amongst the mixture which is pounded between stones and then baked in the ashes into a hard cake (Cleland, Trans. & Proc. Roy. Soc. S. Austral. LXIII, p. 22; 1939).

NOTES ON THE CLEISTOGAMY OF THE AUSTRALIAN SPECIES.—Cleistogamy occurs in at least three Australian species of *Enneapogon*. One—*E. asperatus*—has been previously described (Hook. Ic. Pl. t. 3337; 1937), with its cleistogamy. The other two, *E. cylindricus* and *E. caerulescens*, have their cleistogamous spikelets fully discussed, for the first time, here.

In *E. asperatus* there are axillary inflorescences enclosed in the uppermost leaf-sheaths. The spikelets in these are practically unmodified, and differ from those in the ordinary terminal inflorescences only in a slight increase in size. The release of the grain from such axillary inflorescences is made possible by the disarticulation of the culms at the upper nodes. In another Australian species referred to by Hubbard (loc. cit.), which has been described as *E. cylindricus*, there is a similar disarticulation along the nodes of the flowering culms, and similar axillary inflorescences are present. These are sometimes semi-exserted. Once again the spikelets are practically unmodified in comparison with those of the normal inflorescence. The interesting feature of this species is, however, the development of highly modified, solitary spikelets (cleistogenes) in the axils of broadened, almost leafless, basal sheaths. These spikelets contain two membranous lanceolate glumes, the outer one of which is pubescent to villous (similar to the enclosing sheath), 6–7 mm. long—as compared to 3–4 mm. in the normal spikelet,—and a single fertile lemma which is ovate and almost gibbous, villous in the lower half, 4 mm. long—compared with 1·8 mm. in the normal lemma,—narrowing to an apex which bears nine reduced minutely ciliate awns about 0·5–1 mm. long. The palea and caryopsis are also larger than in normal spikelets, but the sterile lemmas are much the same. *E. cylindricus*, like *E. asperatus*, is a perennial, and the dispersal of such spikelets probably takes place when the sheaths dry and break away. It is suggested that the sheaths also act as insulators against the heat of the soil.

E. caerulescens differs from the others in being an annual. The culms do not disarticulate and the cleistogamous spikelets are in 3-6-spiculate inflorescences with one terminal spikelet and two or more on short lateral branches, the whole being enclosed in enlarged basal leaf-sheaths which have reduced laminae. The terminal spikelet matures first, for in most of the inflorescences examined it already contained a developed grain when the lateral spikelets had undehisced anthers and a young ovary. Chase (Amer. Journ. Bot. v, p. 257; 1918) reports that *Pappophorum Wrightii* S. Wats. (= *Enneapogon Desvauxii* Beauv.) has a cleistogene that consists of a floret without glumes and a rudimentary second floret. This appears to be a more extreme condition than that in *E. cylindricus*. The spikelets in *E. caerulescens* are not greatly modified, but the glumes are longer, the fertile lemma slightly larger and with shorter erect awns.

All these species occur in dry areas with erratic rainfall and sparse vegetation.

In *E. pallidus* and *E. polyphyllus* the semi-exserted inflorescences found in some specimens often have enclosed spikelets whose anthers have already dehisced. Such spikelets are normal in other respects.

HISTORY AND LIMITATION OF THE GENUS.—The first publication of the genus *Enneapogon* Desv. appears to have been in Beauvois's 'Agrostographie' (p. 81; 1812), although Desvaux (Journ. de Bot. i, p. 63; 1813) at the beginning of a paper, which included notes on the genus, says: 'Ce mémoire lu à la Société phylomatique, a été inséré par extrait dans le bulletin de cette société, mais d'une manière incomplète. Je donne ici le mémoire entier, avec des observations suggérées par l'ouvrage que M. de Beauvois vient de publier sur les Graminées.' There is, however, nothing in the journals of the above society about *Enneapogon*. Probably Beauvois attended the meeting at which Desvaux's paper was read and received permission then, or at some other time, to publish the genus in his 'Agrostographie', on whose preparation he was at that time engaged.

Beauvois transferred four species of *Pappophorum* which had been described by Robert Brown (Prodr. p. 185; 1810) and added one additional species *E. Desvauxii* Beauv., the last without description, but validated by a figure with analyses. The genus was distinguished from *Pappophorum* Schreb. by the nature of the lemma and its awns. Trinius (Fundamenta Agrost. p. 155; 1820) included *Enneapogon* in *Pappophorum*. Later, however, Kunth (Rév. Gram. i, p. 82; 1829), having first listed the two as separate genera (Mém. Mus. Hist. Nat. Paris, II, p. 73; 1815), reduced *Enneapogon* to

a subgenus of *Pappophorum* under the tribe Pappophoreae; though in the same year Dumortier (Anal. fam. p. 63; 1829) placed the Pappophoreae in the Bromaceae, giving *Enneapogon* generic status, while Trinius (Mém. Acad. St. Pétersb. ser. 6, Math. Phys. Nat. I, p. 91; 1830) made *Enneapogon* a section of *Pappophorum*. Desvaux (Opusc. sur la Sci. Phys. et Nat. p. 98; 1831) continued to regard *Enneapogon* as distinct, but other workers up to the end of the nineteenth century have followed Kunth and combined it with *Pappophorum*.

E. Desvauxii Beauv., being figured, has been selected as the type species of the genus by Hitchcock ('Manual of the Genera of Grasses U.S.A.' p. 83; 1920), though Nevski (Acta Univ. As. Med., ser. viii b, Bot. Fasc. 17, p. 32; 1934) who separates *Enneapogon* from *Pappophorum*, quotes *Enneapogon nigricans* (R. Br.) Desv. as the type-species. The reference to Desvaux here is presumably due to the fact that a year after Beauvois's publication Desvaux (Journ. de Bot. I, p. 70; 1813) independently transferred Brown's species to *Enneapogon*. In this paper Desvaux refers *E. Desvauxii* Beauv. to *E. gracilis* (R. Br.) Desv. In the same place he mentions that he had examined a specimen from 'îles Manilles'—evidently that of *E. Desvauxii* Beauv., since it is the only locality to which he ever makes reference. However, no species of *Enneapogon* or *Pappophorum* is reported from the Philippines. According to American workers localities quoted by Desvaux cannot be relied upon (Hitchcock & Chase in Contrib. U.S. Nat. Herb. xv, p. 166; 1910). Some years later Desvaux (Opusc. p. 98; 1831) decided that *E. Desvauxii* Beauv. was distinct from *E. gracilis* and publishes a description with the following note: 'Nous l'avons décrit ici, M. de Beauvois n'en ayant donné que la figure, d'après nos collections.' He again gives Manilla as the place of origin. The plant so mentioned is presumably that on which the genus was based. In the British Museum there is a specimen labelled 'Enneapogon, Manilla, Herb. D. Desvaux', in Robert Brown's writing, which indicates that the two authors were in communication at some period. This specimen, which is here accepted as a portion of the type, consists of an inflorescence with a culm bearing three leaves. In the axil of the uppermost is a small axillary inflorescence. It agrees in spikelet character and general habit with *Pappophorum Wrightii* S. Wats. (Proc. Amer. Acad. xviii, p. 178; 1883), which, therefore, lapses into synonymy.

The first Australian material to be described was that by Robert Brown. The species were *Pappophorum nigricans*, *P. pallidum*, *P. purpurascens* and *P. gracile* (Prodr. p. 185; 1810). As has already been stated, these were transferred to *Enneapogon* by Beauvois (loc. cit.). All Brown's species are in this paper regarded as distinct.

Pappophorum caeruleascens Gaudich. (Freye. Voy. Bot. p. 409; 1826) was the next species published. There is a depauperate specimen of it in the Kew Herbarium identified by Gaudichaud and from the type-locality—Sharks Bay in Western Australia; also a better specimen in the British Museum. These have been correlated with modern specimens, and the species is revived here.

Following Mitchell's explorations in northern New South Wales, Lindley described three more species—*P. flavescens*, *P. avenaceum* and *P. virens* (Mitchell, Trop. Austral. pp. 34, 320 & 360 respectively; 1848). Except for Mueller, who considered all Australian material to belong to one species, all writers have accepted Bentham's arrangement (Fl. Austral. VII, p. 600; 1878), which keeps *P. avenaceum* Lindl. distinct, and combines the whole of the rest of the material as *P. nigricans* R. Br. However, *P. virens* Lindl. has a smooth, hardened lemma and agrees with *P. gracile* R. Br., while *P. flavescens* Lindl. has a very strongly ridged lemma with a straight back, and on these characters and the tendency to form loosely branched panicles is separated from *P. nigricans* R. Br.

Mueller ('Fragmenta', VIII, p. 200; 1873) proposed the name *P. commune* for the whole of the Australian material. This name is quite illegitimate.

Bentham (loc. cit.) used the number of nerves in the glumes to distinguish between the species. As will be shown in the generic description, this is not a reliable character throughout the genus. Bentham's arrangement, by which only two species were recognized, was followed until Domin published the results of his collecting in Queensland in 1910. While preparing his paper Domin visited Kew and inspected the material available. As a result of this visit he published *Pappophorum nigricans* var. *barbinode* (Journ. Linn. Soc. Lond., Bot. XLI, p. 277; 1912), which was based on a specimen collected between the Ashburton and De Grey Rivers by Dr. Clement. The specimen is a stunted and immature one. Bearded nodes are found throughout the genus. A few years later Domin published his full results (Bibl. Bot. xx, p. 379; 1915). Here he described one new species, *P. Lindleyanum*, which he thought might include *P. flavescens* Lindl., though from the text it would appear that he had not seen Lindley's specimen at Cambridge. Under *P. Lindleyanum* Domin described five varieties. Var. *convolutum* is his type-variety, and hence comes under *Enneapogon Lindleyanus* (Domin) C. E. Hubbard. There is no specimen of *Pappophorum Lindleyanum* var. *pubescens* in the material sent by Domin to Kew, but there is one labelled var. *convolutum* with the locality of the other variety. This is a very pubescent plant, and agrees well

with Domin's description of var. *pubescens*. Evidently a mistake was made in copying the label. Under var. *convolutum* Domin mentions a larger specimen from Chillagoe; this is *Enneapogon pallidus* (R. Br.) Beauv. *P. Lindleyanum* var. *glaucum* Domin and var. *laguroides* are the same, the latter being a lush specimen with soft, not glaucous, foliage. The two specimens bearing the name *Pappophorum nigricans* var. *barbinode* Domin form a distinct species—*Enneapogon oblongus* N. T. Burbidge. *Pappophorum Lindleyanum* var. *scaberrimum* Domin is a mixture. There are two specimens, one is *Enneapogon pallidus* (R. Br.) Beauv., and the other is a robust form of *E. pubescens* (Domin) N. T. Burbidge.

Under *Pappophorum nigricans* R. Br., Domin published ten varieties. Var. *Brownianum* Domin (loc. cit. p. 381) is a mixture. Brown's Keppel Bay specimen is included in *Enneapogon arenicola* (Domin) N. T. Burbidge. The rest of the material quoted is *E. gracilis* (R. Br.) Beauv. Var. *glabrescens* Domin is also a mixture. The Winton specimen is *E. flavescens* (Lindl.) N. T. Burbidge, the Jericho and Barcaldine specimens are *E. intermedius* N. T. Burbidge and are near *E. gracilis* (R. Br.) Beauv., while Dempster's specimen from the Fraser Range, Western Australia, is *E. nigricans* (R. Br.) Beauv. To var. *robustissimum* Domin and var. *arenicola* Domin, species status is given here. Var. *pallidum* is also a mixture. Robert Brown's specimen 6251 is true *Enneapogon pallidus* (R. Br.) Beauv. The rest of the material quoted belongs to the section of the genus having smooth lemmas. The specimen from Smelling Bluff, Chillagoe, is *E. purpurascens* (R. Br.) Beauv.; Dietrich 738 is *E. gracilis* (R. Br.) Beauv. The rest belong to *E. polyphyllus* (Domin) N. T. Burbidge, i.e. var. *polyphyllum* Domin (loc. cit. pp. 381–2), here raised to species status. The form *plurinerve* Domin under this variety does not seem to be represented amongst Domin's specimens at Kew. Var. *purpurascens* Domin (loc. cit. p. 382) and var. *pubiculme* Domin (loc. cit.) both represent *Enneapogon purpurascens* (R. Br.) Beauv. Var. *gracile* Domin (loc. cit.) is *Enneapogon gracilis* (R. Br.) Beauv. Var. *barbinode* has already been commented upon.

Under *Pappophorum avenaceum* Lindl., Domin (loc. cit. p. 383) listed three varieties, *typicum*, *depauperatum* and *nanum*. The first two are *Enneapogon avenaceus* (Lindl.) C. E. Hubbard, and not distinct varieties. The last is a dwarf specimen of *Enneapogon polyphyllus* (Domin) N. T. Burbidge.

The most recent addition is *Enneapogon asperatus* C. E. Hubbard (Hook. Ic. Pl. t. 3337; 1937).

CHARACTERS OF THE GENUS.

Enneapogon Desv. (in Beauv. Agrost. p. 81 ; 1812), where a brief diagnosis is given and the following species are included—*E. Desvauxii* Beauv., *Pappophorum nigricans* R. Br., *P. gracile* R. Br., *P. pallidum* R. Br. and *P. purpurascens* R. Br. The recombinations of Brown's species are given in the index, p. 161.

Pappophorum subgenus *Enneapogon* Kunth (Rév. Gram. 1, p. 82 ; 1829). Kunth places it in the tribe Pappophoreae, which also contains *Amphipogon*, *Diplopogon*, *Triraphis*, *Cottea* and *Echinaria*. *Enneapogon Desvauxii* Beauv. is not quoted under *Pappophorum*. Presumably Kunth followed Desvaux (Journ. de Bot. 1, p. 63 ; 1813) in assuming the name to be a synonym of *E. gracilis* (R. Br.) Desv.

Pappophorum sect. *Enneapogon* Trin. (in Mém. Acad. St. Pétersb. ser. 6, Math. Phys. Nat. 1, p. 91 ; 1830).

GENERIC DESCRIPTION.—*Panicle* spiciform or more or less interrupted by lateral branches, linear, lanceolate, ovate or oblong in general shape. *Spikelets* shortly pedicellate on very short branchlets, lanceolate or ovate, not flattened. Branchlets and pedicels pubescent with simple and glandular hairs. *Florets* 3–6, of which the lower 1–3 are hermaphrodite, the remainder sterile. *Glumes* lanceolate, ovate or elliptical-oblong ; acute or acuminate or obtuse ; scabrid, with or without pubescence which consists of glandular hairs or these mixed with longer simple ones, or quite glabrous ; commonly 7–9-nerved, but in larger glumes more, and in smaller ones the lateral and intermediary nerves very short or absent. *Fertile lemma* shorter than or equal in length to the glumes, hardened and smooth, or with the nerves prominent just below the origin of the awns or only the awns hardened and prominently ridging the full length of the lemma ; a tuft of silky hairs developed from the base or lower portion, the rest glabrous or with short hairs (where there is more than one fertile lemma, in the spikelet, the upper one or two, as the case may be, quite glabrous) ; usually with a row of hairs, like those of the ligule, inside just below the nine plumose or ciliate (i. e. in Australian species) awns, each containing the continuation of a nerve. *Sterile lemmas* smaller than the fertile, in the lowest floret a palea, the rest reduced to awns only. *Palea* longer than the lemma, thinly membranous, glabrous or minutely pubescent, nerves ciliate. *Lodicules* two. *Stamens* three ; anthers linear. *Ovary* glabrous, obovate ; *styles* two, free ; *stigmas* plumose. *Caryopsis* golden or dark brown, opaque or translucent, oblong or obovate, slightly flattened.

Grasses, annual or perennial, more or less tufted, glabrous or scabrid or pubescent with simple and glandular hairs.

Panicle terminal. In some cases axillary cleistogamous inflorescences present.

Pappophorum differs in having one-nerved glumes and many-awned lemmas. Not all of these awns contain a continuation of a nerve.

The Australian species of *Enneapogon* separate into two groups, those with a ribbed lemma, of which *E. flavescens* is an outstanding example, and those with a smooth lemma, represented by *E. avenaceus*. The non-Australian species appear to have the characters of the first group; ribbed lemmas of such species are illustrated in various publications: *E. persicus* Steud. (Jaubert & Spach, Ill. Pl. Or. iv, t. 323; 1850-3, as *Pappophorum Aucheri* Jaub. & Spach) and *E. Desvauxii* Beauv. (Beauv. Agrost. pl. xvi, fig. xi; 1812), and as *Pappophorum Wrightii* S. Wats. (Vasey, Ill. N. Amer. Grasses in U.S. Dep. Agric., Div. Bot. Bull. no. 12, II, t. 28; 1891). *Enneapogon elegans* (Nees) Stapf, an Indian and East African species, however, approaches the smooth lemma type of structure. This character of the lemma is discernible at any stage of immaturity, at least to the extent of deciding which form the mature lemma will take. The ribbed lemma is probably the more primitive form, the species having it being the more widely distributed, but, apart from this, discussion of any possible or probable phylogeny of the Australian species distinct from their overseas affinities is not considered profitable without cytological investigation.

The presence of a row of hairs on the lemma, like those of the ligule on the normal foliage leaf, supports Philipson's analysis of the morphology of the lemma ('New Phytologist', xxxiii, p. 359; 1934). In this case the comparison is a very close one. The lemma represents the sheath, the ligule of hairs is normal, though not always very strongly developed, and the awns represent the blade of the leaf.

KEY TO THE AUSTRALIAN SPECIES OF *ENNEAPOGON*.

Lemma smooth, evenly indurated at maturity or with the nerves slightly prominent below the origin of the awns, resembling the knuckles on the back of a fist. Nerves of the glumes 7-21.

Lowest lemma as long as or shorter than broad, the awns arising at about the same level, so that the lemma appears almost globular.

Glumes broadly ovate, more than 13-nerved.

Lowest lemma (with its awns) 9-12 mm.

long. Panicle loose. Usually annual . . . **1. *avenaceus*.**

Glumes lanceolate to ovate, 9-13-nerved.

Lowest lemma (with its awns) 7-8 mm.

long, nerves often knuckled below awns;

lemma pubescent, with short hairs. Pan-

icle compact. Perennials.

- Slender tufted plant. Basal sheaths quite or almost glabrous. Leaves mostly basal 2. *gracilis*.
- Erect, loosely growing plant. Basal sheaths pubescent or villous, with long simple hairs. Leaves spreading, not mostly basal 3. *intermedius*.
- Lowest lemmas longer than broad, awns arising at lower levels on each side so that apex of lemma appears obtuse, and the lemma urceolate. Glumes with less than 11 nerves.
- Leaves pubescent, with both simple and glandular hairs. Perennials or annuals, which sometimes last more than one season.
- Densely caespitose. Glumes ovate, acute or obtuse 4. *purpurascens*.
- Spreading or loosely tufted. Glumes lanceolate, acuminate 5. *polyphyllus*.
- Leaves glabrous or the blades sparingly pubescent on the lower surface. Annuals.
- Lowest lemma (with awns) 7–8 mm. long. Plant not glaucous 6. *glaber*.
- Lowest lemma (with awns) 3–4 mm. long. Plant glaucous 7. *planifolius*.
- Lemma thickened along the nerves, which are prominent the whole of its length. Glumes 5–9-nerved.
- Culms not disarticulating. Inflorescence ovate, elliptical or lanceolate.
- Lower glume lanceolate, acute or acuminate, scaberulous, with few hairs, either glandular or simple, or quite glabrous.
- Lowest lemma deeply ribbed, dorsally straight. Panicle loose, often branched laterally 8. *flavescens*.
- Lowest lemma not very deeply ribbed, dorsally convex. Panicle dense and compact.
- Glumes minutely and sparsely pubescent. Awns stiff 9. *nigricans*.
- Glumes glabrous. Awns soft 10. *arenicola*.
- Lower glume elliptical or elliptical-lanceolate, obtuse or ragged at the apex.
- Glumes of mature spikelets about the same size throughout the inflorescence. No cleistogamous spikelets in basal leaf-sheaths.
- Awns plumose in the lower half, at least twice as long as lemma. Robust plants, very retrorsely scabrid. Glumes glabrous. Lowest lemma dorsally convex 11. *robustissimus*.
- Awns plumose in at least the lower two-thirds (or if approaching half then the awns not twice as long as the lemma).
- Lowest lemma of a spikelet when containing a ripe grain, dorsally convex and in its natural position elliptical in side view. Palea enclosed by

the slightly incurved margin of the lemma, or, if grain is almost as long as lemma, free. Hairs on the back of lowest lemma rather short, dense, developing irregularly from the lower one- to two-thirds.

Erect tufted plants with leaves minutely glandular pubescent. Internodes pubescent or almost villous.

12. *pallidus* & var.

Rigid, spreading or erect plants with glaucous, glabrous leaves and sheaths. Internodes almost glabrous.

13. *Clelandii*.

Lowest lemma of the spikelet when containing mature grain, dorsally straight, and in its natural position asymmetrically cuneate or linear in side view. Palea enclosed by conduplicate lemma or, when grain is ripe, free. Hairs of back of lemma long, developed from basal third.

Palea evenly pubescent all over or glabrescent. Lemma up to 2.5 mm. long.

Slender, minutely glandular, pubescent or glabrescent plants, loosely tufted, much branched from upper nodes. Leaves spreading, involute.

14. *Lindleyanus*.

As previous, but larger, more caespitose and very pubescent, with both simple and glandular hairs. Sometimes coarse growing and with flat leaves. .

15. *pubescens*.

Palea with glabrous patch at apex between nerves. Coarse glaucous plant. Lemma 2.5-4 mm. long.

16. *oblongus*.

Glumes of mature spikelets, much larger towards the apex of inflorescence (up to twice as large). Cleistogamous spikelets present in enlarged basal sheaths.

17. *caerulescens*.

Culms disarticulating. Axillary inflorescences in uppermost leaf-sheaths. Main inflorescence linear.

Culms branching from upper nodes.

18. *asperatus*.

Culms branching from base only.

19. *cylindricus*.

1. ENNEAPOGON AVENACEUS (Lindl.) C. E. Hubbard in Kew Bull. 1934, p. 450. Based on *Pappophorum avenaceum* Lindl. in Mitchell, Trop. Austral. p. 320 (1848). The type from the Lindley Collection at Cambridge has been studied. Mitchell collected the specimen in 145° 2' E., 24° 1' S. on the Victoria River (now known as the Barcoo River), 22 September 1846. The river at this camp had a clay bed and the herbage

on the banks was abundant. The specimen consists of the upper parts of the culms and panicles.

P. avenaceum var. *typicum* Domin in Bibl. Bot. xx, p. 383 (1915); based on *P. avenaceum* Lindl.

P. avenaceum var. *depauperatum* Domin, loc. cit. Domin's specimen which is in the herbarium at Kew—Andrews 69 from the vicinity of Lake Eyre—has rather smaller spikelets and a more stunted growth than the type. However, it is not a distinct variety, as intermediates are available. Also other specimens at Kew show a variation in the size of the spikelets even within one inflorescence.

Description.—A loosely tufted annual, which may rarely behave as a perennial, 10–30 cm. high. *Culms* simple, erect or spreading, villous at the base; nodes bearded; internodes pubescent or glabrescent. *Leaves* pubescent with simple and glandular hairs, finely striate; sheaths loose, longer than the internodes; blades up to 12 cm. long or, in stunted specimens, very short, commonly involute, but sometimes flat. *Inflorescence* loose and oat-like, spikelets shortly pedicellate on lateral branches, or these short and the inflorescence loosely compact. *Glumes* broadly lanceolate or ovate, acute, with a thin membranous border outside the nerved portion, 13–21-nerved, pubescent with both simple and glandular hairs; lower glume 5–7 mm. long; upper glume 8–9 mm. long. *Fertile lemmas* two or three to each spikelet, decreasing slightly in size from below upwards; lowest short and broad, 2 mm. long, smooth and indurated, nerves quite obscure, with a basal tuft of silky hairs at least as long as the lemma and an inner row of hairs just below the awns; awns 6–12 mm. long, softly plumose in the lower half to two-thirds, scabrid dorsally and along the margins of the upper third; *palea* broadly obovate, 2.5 mm. long, pubescent on the nerves; *anthers* 0.5 mm. long; *caryopsis* 1.5–2 mm. long, obovate, flattened. Other fertile lemmas similar except for size, but lacking the large basal tuft of hairs. *Sterile lemmas* with a palea in the lowest one or possibly two florets, the rest reduced to awns only (fig. 1).

The closest affinity is with *E. gracilis* (R. Br.) Beauv., which is a tufted perennial and is less pubescent. It has similar but smaller spikelets with fewer nerved glumes and only one fertile lemma, the lemma being shortly pubescent.

Distribution.—Widely distributed in drier areas throughout the continent. All States except Tasmania. Prefers open ground, e.g. Hubbard found it colonizing bare ground in *Astrebla lappacea* grassland, in open *Eucalyptus* forest, along railway tracks and in the sparse vegetation of the sandhills to the east of the Nullarbor Plain. Cleland reports it from crabhole tablelands at Andamooka Station.



FIG. 1.—*Enneapogon avenaceus*. 1, a plant reduced to 0.75; 2, a ligule, $\times 3$; 3, a spikelet, $\times 3$; 4, florets in side-view, $\times 3$; 5 and 6, lower and upper glumes from inside, $\times 3$; 7, lower lemma from inside, $\times 4.5$; 8, palea from inside and outside, $\times 4.5$; 9, a flower, $\times 9$; 10, a caryopsis from the hollow face, $\times 9$; 11, lodicules, $\times 9$. Drawn from Hubbard & Winders, 7068.

Western Australia. Wandagee Station, Minilya River, *Gooch*; Warburton Range, *Carr Boyd*; Trans-Australian Railway Survey, *Antekell*.

Central Australia. Cockatoo Creek, *Cleland* H382; Fraser River, *Pulleine*; MacDonald Downs, *Chalmers* 21 (*Cleland* H520); Alice Springs, *Allen* 651; Hermansburg Mission; Kulgera, *Patton* 17; Charlotte Waters, *Giles*.

South Australia. Arkaringa Creek, *Helms*; vicinity of Lake Eyre, *Andrews* 69; Stuart's Creek, *Basedow*; Curdimurka Station, north of Marree, *Cleland* H406; Andamooka Station, *Cleland* H320; Frome Downs, *Wade*; Flinders Range, *Cleland* S.A. 18-37; Tarcoola, *Ising* 1642; Wynbring, *Hubbard* 8294; Port Augusta, *Lea* (Brit. Mus.); without precise localities, *MacDougal Stuart*, *Gosse* 54, 209, *Hillier* 59 and 75, *Whittet*.

Queensland. Mt. Isa, *Winders* in Herb. Hubbard 7387; Cloncurry, *Hubbard* 7313; Cloncurry, *Allen* 12; Marathon Station west of Hughenden, *Hubbard* 7753; Nonda, between Hughenden and Cloncurry, *Hubbard and Winders* 7241; Bundoran, near Nonda, *Hubbard and Winders* 7254; between Hughenden and Cloncurry, *Domin* (Herb. Domin); Jardine Valley near Hughenden, *Hubbard and Winders* 7171; Hughenden, *Hawthorn*; Prairie, *Hubbard and Winders* 7068; Winton, *Domin* (Herb. Domin); Darr River, *Birch*; Coolibah, *Mitchell, Haywood*; Victoria River (Barcoo River), *Mitchell* (type) (Herb. Lindl.); Blackall, *Stringer* (Herb. Brisb.); between Roxburgh Downs and Boulia, *Bailey*; near Gurulmundi, *Belson* (Herb. Brisb.); Chinchilla, *Beasley*; Jandowae, *Moore*; between Amby and Eurella, *Hubbard and Winders* 6472; Mungallala, *Hubbard and Winders* 6066 (in part); Charleville, *Beltridge*; Offham, between Charleville and Cunnamulla, *Hubbard and Winders* 6178 (in part).

2. *ENNEAPOGON GRACILIS* (R. Br.) Beauv. Agrost. pp. 82 and 161 (1812); Desvaux in Journ. de Bot. i, p. 70 (1813). Based on *Pappophorum gracile* R. Br., Prodr. p. 185 (1810). The type, Brown's 6252, is from Broad Sound, Queensland. The species was included in *P. nigricans* R. Br. by Bentham, Fl. Austral. vii, p. 600 (1878) and revived as *P. nigricans* var. *gracile* Domin in Bibl. Bot. xx, p. 381 (1915).

P. virens Lindl. in Mitchell, Trop. Austral. p. 360 (1848) is a small rigid form of *Enneapogon gracilis*, but not a distinct species.

Description.—A slender tufted perennial, 20–40 cm. high. Culms slender, erect, glabrous or very shortly pubescent at the base, 3–4-noded; nodes shortly pubescent; internodes glabrescent. Leaves minutely glandular pubescent or glabrous; sheaths shorter than the internodes and often free from them; blades erect, involute, 4–8 cm. long. Panicle linear or lanceolate, loose or rather compact, 4–8 cm. long. Glumes broad

lanceolate, acuminate or acute, the nerveless membranous margin not so broad as in *E. avenaceus*, 7-13-nerved, pubescent with numerous minute glandular hairs; lower glume 4-5 mm., upper 6-7 mm. long. *Fertile lemma* one per spikelet, short and broad, 1.5 mm. long, smooth and indurated, nerves marked by green stripes or obscure, and forming lumps at the base of the awns, like the knuckles on the back of a fist, lower third to half clothed with short hairs, and with a short, thin row of hairs inside below awns; awns plumose-ciliate in at least the lower two-thirds, 5-7 mm. long; palea broad oblong or obovate, 2 mm. long, ciliate on the nerves; anthers 0.75 mm. long; *caryopsis* 1.25 mm. long, obovate, flattened. *Sterile lemmas* with a palea in the lowest floret and the rest reduced to awns only.

Apart from the affinity with *E. avenaceus*, there is a close relationship with *E. intermedius*, which is a much more robust plant with a pubescent or villous base and lacking the basal tuft of erect leaves which seems to be the rule in *E. gracilis*.

Distribution.—In open *Eucalyptus* forest and in black soil grassland.

Queensland. Mt. Emu Plains Station, 64 miles north of Hughenden, *Hubbard and Winders* 7545, 7547; Warrigal, on Great Dividing Range, *Hubbard and Winders* 7156; Charters Towers, *Domin* (Herb. Domin); Torrens Creek, *Pollock* (Herb. Brisb.); Broad Sound, *Brown* 6252 (type); East coast, *Brown*; Rangal, *Hubbard* 7980; Dingo, *Hubbard* 8017; between Emerald and Peak Downs, *Hubbard* 7941; Springsure, *Wuth* (Brit. Mus.); Herberts Creek, *Bowman*; Biloela, Port Curtis District, *Strong* A56; Callide, *Cowdry*; Mundubbera, *Bloxsome*; Wandoan, *Hubbard* 4930; Gurdumundi, *Belson* (Herb. Brisb.); Roma, *White* 9582; Gunnewin, via Roma, *Kieseker* 11 (Herb. Brisb.); Mungallala, *Hubbard and Winders* 6013, 6066 (in part); Morven, *McComb*; Dalby, *Beiers* 13, 50 (Herb. Brisb.); Drayton, *Blake* 5170 (Herb. Brisb.); Brisbane River, *Dietrich* 696 (Herb. Domin); Darling Downs, between Pittsworth and Milmerran, *White* 10053 (Herb. Brisb.); Montrose, *Hubbard* 5559; west of Warwick, *Hubbard* 5752; Noondoo Station, via Warwick, *Young* (Herb. Brisb.); Wybera, *Blake* 4688 (Herb. Brisb.); Darling Downs, *Donges*; South Queensland, *Mueller*; without precise locality, *Dietrich* 738 (Herb. Domin).

New South Wales. Liverpool Plains, *Moore* 114; without precise locality, *Whittet*.

3. *Enneapogon intermedius*, *N. T. Burbidge*; includes some of the material cited under *Pappophorum nigricans* var. *glabrescens* Domin in *Bibl. Bot.* xx, p. 381 (1915). Domin's variety is a mixture of *Enneapogon flavescens*, *E. nigricans* and the above species.

Description.—Tufted perennial, 40–60 cm. high, pubescent at the base. *Culms* erect, simple, rigid; nodes bearded; internodes pubescent. Leaves pubescent with glandular hairs, antrorsely scabrid; sheaths longer than the internodes; blades linear, 10–18 cm. long, 2–4 mm. wide, and with a marked tendency to disarticulate from the sheath, involute, spreading. *Panicle* compact, linear-lanceolate, entire or interrupted, spiciform, 5–10 cm. long, 1.5–2 cm. wide (including awns). *Glumes* lanceolate, acuminate or acute or obtuse, 9–11-nerved, pubescent with simple and glandular hairs, lower glume 4 mm., upper 5 mm. long. *Fertile lemma* short and broad, truncate at the apex as in the two preceding species, 1.5 mm. long, smooth and indurated, with a long tuft of hairs at the base as long as lemma or shortly pubescent, and a thin row of hairs inside below the awns; awns at least three times as long as the lemma, plumose-ciliate in the lower two-thirds, 4–6 mm. long; palea oblong or obovate, 2 mm. long, ciliate on the nerves; anthers 1 mm. long; caryopsis broadly oblong, 1 mm. long. *Sterile lemmas* with a palea in the lowest floret, rest reduced to awns only.

Distribution.—Central and southern Queensland, in open *Eucalyptus* forest; New South Wales.

Queensland. Lake Elphinstone, *Dietrich* (Mus. Brit.); Coolibar, Mitchell, *Haywood*; Barcaldine, *Domin* (Herb. Domin); Jericho, *Domin* (Herb. Domin); Alpha, *Hubbard* 7881 (type); between Emerald and Peak Downs, *Hubbard* 7956; between Amby and Eurella, *Hubbard and Winders* 6314.

New South Wales. Without precise locality (? Darling River), 1835–6, *Mitchell*.

***Enneapogon intermedius* N. T. Burbidge, sp. nov.**; *Pappophorum nigricans* var. *glabrescens* Domin in Bibl. Bot. xx, p. 381 (1915), pro parte; affinis *E. gracili* (R. Br.) Beauv. sed basibus pubescentibus, culmis robustioribus, paniculis densioribus, laminis caducis differt.

Gramen perenne, 40–60 cm. altum, caespitosum, basi pubescens. *Culmi* erecti, 4–6-nodes, teretes, simplices, rigidi, nodis barbatis, internodiis pubescentibus tenuissime striatis. *Folia* pilis glanduliferis minute pubescentia, antrorse scabra; vaginae internodiis longiores; ligulae ad seriem ciliorum redactae; laminae lineares, 10–18 cm. longae, 2–4 mm. latae, involutae vel planae, e vaginis demum disarticulantes. *Paniculae* terminales, continuae vel basi interruptae, laxae vel compactae, lineares vel lineari-lanceolatae, 5–10 cm. longae, 1.5–2 cm. latae (setis inclusis), exsertae; rhachis et rami pubescentes. *Glumae* lanceolatae, acuminatae vel acutae vel obtusae, 9–11-nerves, pilis simplicibus et glandiferis pubescentes, pallidae, demum stramineae, inferior 4 mm. longa; superior 5 mm. longa. *Lemma fertile* breve, latum, truncatum, laeve, demum induratum, brevissime pubescens, vel, basi villosa excepta glabrum, pilis lemmati longioribus vel aequalibus, 1.5 mm. longum (setis exclusis); setae 4–6 mm. longae, pallidae vel purpurascens, parte tertia superiore excepta plumosae. *Palea* 2 mm. longa, obovato-oblonga, carinis ciliolata. *Antherae* 1 mm. longae. *Caryopsis* late oblonga, 1 mm. longa. *Lemmata sterilia* usque 0.5 mm. longa vel ad setas redacta.

4. *ENNEAPOGON PURPURASCENS* (R. Br.) Beauv. Agrost. pp. 82 and 161 (1812); Desvaux in Journ. de Bot. i, p. 70 (1813). Based on *Pappophorum purpurascens* R. Br. Prodr. p. 185 (1810). The type is from Carpentaria, Brown's 6250. The species was included in *P. nigricans* by Bentham (Fl. Austral. vii, p. 600; 1878). *P. nigricans* var. *purpurascens* Domin in Bibl. Bot. xx, p. 382 (1915) is a synonym, Brown's specimen being quoted. Here Domin stated that the leaves are glabrescent despite Brown's statement, 'foliis pubescentibus'. Pubescent forms were listed as *P. nigricans* var. *pubiculme* Domin, loc. cit. However, close inspection of Brown's material at Kew has shown that the glabrescent appearance is due to the glue used in mounting the specimen, so that the differences between Domin's two varieties disappear.

Description.—A densely caespitose perennial, 30–50 cm. high. Culms erect or geniculately ascending; 5–8-noded, nodes bearded; internodes pubescent or glabrescent, branching from the upper nodes. Leaves pubescent with long simple and short glandular hairs; sheaths mostly longer than the internodes; blades 8–15 cm. long, flat or slightly or closely involute. Panicle cylindrical or lanceolate, spiciform, 4–7 cm. long. Glumes ovate, obtuse, 9–11-nerved, central nerves often scabrid, pubescent with simple and glandular hairs; lower glume 3–5 mm. long, upper 4–6 mm. long. Fertile lemma one per spikelet, longer than broad, with the awns arising from successively lower levels so that the lemma has an obtuse apex, glabrous except for a basal tuft of hairs, and with a very thin row of hairs inside below awns; awns often purplish, plumose-ciliate in the lower half to two-thirds, 6 mm. long; palea oblong to obovate, 2.5 mm. long, nerves ciliate; anther 1 mm. long; caryopsis 1.5 mm. long. Sterile lemmas with a palea in the lowest floret, the rest reduced to awns only.

Distribution.—Confined to northern Queensland. Hubbard collected it on slopes among limestone boulders.

Queensland. Carpentaria, Brown 6250 (type); Gilbert River, White 1494; Chillagoe, Domin (Herb. Domin); Smelling Bluff, Chillagoe, Domin (Herb. Domin); Chillagoe, Hubbard and Winders 6782.

5. *Enneapogon polyphyllus* (Domin) N. T. Burbidge, stat. nov. Based on *Pappophorum nigricans* var. *polyphyllus* Domin in Bibl. Bot. xx, p. 381 (1915). The type was collected on the Victoria River, Northern Territory, during December 1855, by Mueller on Gregory's North Australian Expedition.

P. nigricans var. *pallidum* Domin, loc. cit., includes a number of specimens which belong to this species, and not to *P. pallidum* R. Br.

P. avenaceum var. *nanum* Domin, loc. cit. p. 383, is a dwarf and stunted specimen collected at Cloncurry, Queensland.

P. nigricans var. *polyphyllus* f. *plurinerve* Domin, loc. cit. p. 392, has not been seen.

Description.—Annual or short-lived perennial, loosely tufted, 15–35 cm. high. *Culms* erect, spreading, geniculately ascending, much branched from the upper nodes; nodes bearded; internodes pubescent. *Leaves* pubescent with simple and glandular hairs, striate; sheaths loose, shorter than the internodes, uppermost commonly enlarged and semi-enclosing the immature inflorescences; blades erect or spreading, with fine acuminate points, 7–15 cm. long, 2–4 mm. wide, involute. *Panicle* loose, linear, linear-lanceolate or oblanceolate, spiciform, 5–7 cm. long, the terminal spikelets maturing first, this being correlated with the enclosing of the immature inflorescences in the leaf-sheaths. Some of the enclosed spikelets behave cleistogamously. Panicle later exerted on an erect peduncle. *Glumes* lanceolate, narrowing to an acuminate or acute apex, 5–11-nerved, pubescent like the rest of the plant, lower glume 5–6 mm. long, upper 6–7 mm. long. *Fertile lemma* one per spikelet, similar to that of *Enneapogon purpurascens* (R. Br.) Beauv., but 2–3 mm. long; awns pale, purplish or blackened, plumose in the lower two-thirds, 6–7 mm. long; palea oblong to oblanceolate, pubescent, 2.5–3.5 mm. long; caryopsis obovate or oblong, slightly flattened, 1.5 mm. long. *Sterile lemma* with a palea in the lowest floret, rest reduced to awns (fig. 2).

Distinguished from *E. purpurascens* by habit, shape of glumes and loose panicle. North Queensland specimens are sometimes more slender and less pubescent.

Distribution.—Drier areas of all States except Victoria and Tasmania. Growing in open ground.

Western Australia. Noonkanbah Station, West Kimberley, *Station Manager*; De Grey River, *Anderson*; Port Hedland, *Fitzgerald*; Mulga Downs Station, *Stewart*; Wandagee Station, Minilya River, *Gardner*; Pinnacles Station, west of Leonora, *Stewart*; Warburton Range, *Carr Boyd*; 'Swan River', *Drummond*; without precise locality, *Giles*.

North and Central Australia. Victoria River, *Mueller* (type); Coglein River, *Basedow*; Granites, *Cleland* C.A.19/36, C.A.20/36, C.A.21/36; Cockatoo Creek, *Cleland* H381; Mount Liebig, *Cleland* L20, L21; Brookes Soak, *Cleland* H380; Burt Well, *Cleland* H383; MacDonnell Range, *Menzel*; Haast's Bluff, *Cleland* L22; MacDonald Downs, *Cleland* H77, H536; Alice Springs, *Allen*; between Alice Springs and Charlotte Waters, *Giles*; West Mount, Sir Henry, Ayers Range, *Basedow*; '35 miles N.E. of Camp 2', *Hill*.

South Australia. Cordillo Downs, *Cleland* H321; Innaminche, *Cleland* H316; M. Lyndhurst, *Koch* 57 (in part); Beltana, *Cleland*, H317; Koonamore Reserve, *Paltridge*;



FIG. 2.—*Enneapogon polyphyllus*. 1, a plant, reduced to 0.75; 2, a ligule, $\times 3$; 3, a spikelet, $\times 3$; 4, the lower glume from inside, $\times 3$; 5, the upper glume from inside, $\times 3$; 6, a pair of florets, $\times 4.5$; 7, lemma seen from inside, $\times 4.5$; 8, palea from outside, $\times 4.5$; 9, the same from inside, $\times 4.5$; 10, the same from the side, $\times 4.5$; 11, a flower, $\times 9$; 12, lodicules, $\times 9$; 13, a caryopsis, $\times 9$; 14, the same in transverse section, $\times 9$. Drawn from Hubbard 7169.

Flinders Range, *Cleland* S.A.22/37, S.A.20/37, S.A.15/37; Wilgena, near Tarcoola, *Cleland* H314; without precise locality, *Gosse* 21, 32, 113.

Queensland.—Chillagoe, *Hubbard and Winders* 6823; Almaden, *Hubbard and Winders* 6730; Gilbert River, *Brass* 1718, 1800, 8191, also *White* 1495; Settlement Creek, *Brass*; Mount Isa, *MacCallum*; Mount Isa, *Winders* in Herb. *Hubbard* 7415; Cloncurry, *Allen*, also *Domin* (Herb. *Domin*), also *Hubbard* 7315; Longara between Cloncurry, and Duchess, *Hubbard* 7365; Hughenden, *Hawthorn*; Jardine Valley, near Hughenden, *Hubbard and Winders* 7769; Prairie, *Hubbard and Winders* 7030; Torrens Creek, *MacLean* 7, also *White* 8764, 8748; Charters Towers, *Domin* (Herb. *Domin*), also *Hubbard and Winders* 6995; Middleton, *Bailey*; north of Clermont, *Sutton*; Comet, *Hubbard* 7971; Fernlees, *Garvey* 69; Lochnagar, Rocklea, *Sutherland*; Windorah, *Rose*; Charleville, *Hubbard and Winders* 6123; Nardoo, between Charleville and Cunnamulla, *Hubbard and Winders* 6154; Offham, between Charleville and Cunnamulla, *Hubbard and Winders* 6178; Curragh Station, near Cunnamulla, *Hubbard and Winders* 6252.

New South Wales. Darling Downs, *Beckler*; Broken Hill, *Morris*.

6. *Enneapogon glaber* N. T. Burbidge. Based on a specimen collected by Connor in East Kimberley District, Western Australia.

Description.—Annual, caespitose, 40–45 cm. high. *Culms* erect or geniculately ascending, 3–5-noded, slender, rigid base slightly pubescent or glabrous; nodes bearded; internodes glabrous, more or less smooth. *Leaves* bright green, glabrous or with a few sparse hairs on the upper surface of the blades, or slightly scabrid; sheaths shorter than the internodes; hairs of the ligule conspicuous at the side; blade narrow linear, flat, 10–15 cm. long, 2–4 mm. wide, apex long, thin and hair-like. *Panicle* linear or linear-lanceolate, lax, interrupted or entire, spiciform, 6–8 cm. long, 1.2 cm. wide including the awns. *Glumes* ovate or ovate-lanceolate, acuminate, acute or obtuse, 7–9-nerved, pubescent with simple and glandular hairs, pale in colour; lower glume 4–4.5 mm. long, upper 5–6 mm. *Fertile lemma* elliptical-oblong or narrow ovate, 2.5 mm. long, smooth and indurated, glabrous except for the basal tuft of hairs, and a very thin row of hairs inside below the awns, nerves obscure; awns purplish, 5–7 mm. long, lower two-thirds plumose ciliate; palea 3 mm. long, nerves ciliate; anthers 1.25 mm. long; caryopsis broadly oblong, 1 mm. long. *Sterile lemmas* about 1 mm. long, with a palea in the lowest floret, the remainder reduced to awns.

Distribution.—During the summer months in extreme north-west of Western Australia.

Western Australia. Victoria River, *Elsey*; East Kimberley, *Connor* 12 (type); North-Western Australia, *Stoward* (Brit. Mus.).

Enneapogon glaber *N. T. Burbidge*, sp. nov.; affinis *E. purpurascens* (R. Br.) Beauv., sed habitu annuus, laminis glabris, paniculis majoribus laxis distinguatur.

Gramen annuum, caespitosum, usque 40–45 cm. altum. *Culmi* erecti vel geniculato-ascendentes, 3–5-nodes, teretes, simplices, graciles, rigidi, basi glabri vel pubescentes, nodis barbatis, internodiis glabris laevibus vel tenuissime striatis. *Folia* viridia, glabra, raro pubescentia, leviter scabra; vaginae internodiis breviores, tenuissime striatae; ligulae ad seriem ciliorum redactae, pilis lateralibus longioribus; laminae anguste lineares, planae, 10–15 cm. longae, 2–4 mm. latae, apice setiformes. *Paniculae* terminales, continuae vel interruptae, laxae, lineares vel lineari-lanceolatae, spiciformes, 6–8 cm. longae, 1–2 cm. latae (setis inclusis), exsertae; rhachis et rami pubescentes. *Glumae* ovatae vel ovato-lanceolatae vel lanceolatae, acuminatae, acutae vel obtusae, 7–9-nerves, pilis simplicibus et glanduliferis pubescentes, subvirides, demum stramineae; inferior 4–4.5 mm. longa; superior 5–6 mm. longa. *Lemma* fertile elliptico-oblongum vel elliptico-ovatum, laeve, demum induratum, basi villosa excepta glabrum, 2.5 mm. longum (setis exclusis), nervis haud prominentibus; setae purpurascens, 5–7 mm. longae, parte tertia superiore excepta plumoso-ciliatae. *Palea* 3 mm. longa, carinis ciliolata. *Antherae* 1.2 mm. longae. *Caryopsis* latissime obovato-oblonga, 1 mm. longa. *Lemmata sterilia* usque 1 mm. longa vel ad setas redacta.

This species and *E. planifolius* are both remarkable for the long hair-like apices of the leaf-blades.

7. *Enneapogon planifolius* *N. T. Burbidge*.

Description.—Perennial, caespitose, 20–35 cm. high. *Culms* erect or geniculately ascending, slender, rigid, 5–7-noded, villous at the base; nodes bearded; internodes glabrous, smooth. *Leaves* pale green, glaucous, scabrid or smooth, rarely sparsely hairy; blades narrowly linear, erect, flat or the smaller ones involute, apex long and hair-like as in the preceding species. *Panicle* cylindrical, entire, spiciform, 3–5 cm. long, 0.75–1 cm. wide including awns. *Glumes* ovate-lanceolate or lanceolate, obtuse or acute, 7–9-nerved, pubescent with simple and glandular hairs, pale green; lower glume 3 mm. long, upper 4 mm. *Fertile lemma* oblong or ovate-oblong, 1.5 mm. long, smooth and indurated, nerves obscure or rarely just visible, tuft of long silky hairs at the base and the inside row of hairs almost absent; awns purplish, 2–3 mm. long, plumose-ciliate in the lower two-thirds; palea oblong, 2 mm. long, nerves ciliolate; anthers 0.5 mm. long; caryopsis oblong, 1 mm. long. *Sterile lemmas* 0.5 mm. long and with a palea in the lowest floret, rest reduced to awns or vestigial.

Distribution.—Western Australia. Noonkanbah Station, West Kimberley, *Station Manager* (type); Port Hedland, *Fitzgerald*; Whim Creek, *Mitchell*.

Enneapogon planifolius N. T. Burbidge, sp. nov.; affinis *E. glabro* N. T. Burbidge, sed laminis glaucis, paniculis linearibus minoribus, spiculis minoribus distinguitur.

Græmen perenne, caespitosum, usque 20–35 cm. altum. *Culmi* erecti vel geniculato-ascendentes, teretes, simplices, graciles, rigidi, 5–7-nodes, e basi villosula ramosi, nodis barbatis, internodiis laevibus glabris. *Folia* pallida, glauca, leviter scabra vel laevia, pilis simplicibus raro sparse pubescentia, striata; vaginae internodiis longiores; ligulae ad seriem densam ciliorum redactae, pilis lateralibus longis; laminae anguste lineares, erectae, planae, 6–12 cm. longae, 2–3 mm. latae, laminae minores involutae, in apicem setiformem tenuiter attenuatae. *Paniculae* terminales, continuæ, lineares, spiciformes, 3–5 cm. longae, 0.75–1 cm. latae (setis inclusis), exsertae; rhachis et rami pilis simplicibus et glanduliferis pubescentes; pedicelli laterales brevissimi. *Glumæ* ovato-lanceolatae vel lanceolatae, obtusae vel acutae, 7–9-nerves, pilis simplicibus et glanduliferis minutis pubescentes, pallide virides; inferior 3 mm. longa; superior 3.5 mm. longa. *Lemma fertile* late elliptico-oblongum vel ovato-oblongum, laeve, demum induratum, nervis non prominentibus, basi villosum, 1.5 mm. longum (setis exclusis); setae purpurascens, 2–3 mm. longae, parte tertia superiore excepta plumoso-ciliatae. *Palea* 2 mm. longa, carinis ciliolata. *Antherae* 0.5 mm. longae. *Caryopsis* oblonga, 1 mm. longa. *Lemmata sterilia* usque 0.5 mm. longa vel ad setas redacta.

8. **Enneapogon flavescens** (Lindl.) N. T. Burbidge, comb. nov. Based on *Pappophorum flavescens* Lindl. in Mitchell, Trop. Austral. p. 34 (1848). The type was collected by Mitchell on the Bogan River, south of Nyngan, New South Wales, 13 January 1846, and is now in the Lindley collection at Cambridge.

Description.—Perennial, caespitose, 30–40 cm. high, pubescent or glabrescent at the base. Culms erect, rigid, bearded at the nodes; internodes glabrescent, finely striate. *Leaves* minutely glandular-pubescent, sheaths shorter than the internodes; blades slender, erect, involute, 7–11 cm. long. *Panicle* compact or loose and branched, ovate or lanceolate on general outline, but interrupted by the loose lateral branches. *Glumes* lanceolate, acute, with a well-marked membranous margin beyond the nerves, 5–9-nerved, scabrid or with few glandular hairs, lower glume 4 mm., upper 5 mm. long. *Fertile lemma* dorsally straight so as to appear cuneate in side view, 1.75–2 mm. long, deeply ribbed by prominent nerves so as to seem corrugated when mature, glabrous except for a basal tuft of silky hairs, and a thin row of short hairs inside below the awns; awns plumose-ciliate for at least the lower two-thirds, 5–6 mm. long; palea pubescent, 2–2.5 mm. long, nerves ciliolate; anthers 0.5 mm. long; caryopsis 1–1.5 mm. long, oblong. *Sterile lemmas* with a palea in the lowest floret, rest reduced to awns only (fig. 3).

Hubbard 7930, which is figured, agrees closely with the type-specimen, and also shows a tendency to the shorter-awned specimens which make up the bulk of the material available. The corrugated lemma is particularly marked in these latter, but they do not seem to be a distinct variety.



FIG. 3.—*Enneapogon flavescens*. 1, a plant, reduced to 0.75; 2, a ligule, $\times 3$; 3, a spikelet, $\times 3$; 4, the lower glume from inside, $\times 3$; 5, the upper glume from inside, $\times 3$; 6, florets, $\times 4.5$; 7, a lemma, $\times 4.5$; 8, palea from within and slightly flattened, $\times 4.5$; 9, the same from the side, $\times 4.5$; 10, the androecium and gynoecium, $\times 9$; 11, lodicules, $\times 9$; 12 and 13, a caryopsis, $\times 9$. Drawn from Hubbard 7930.

The habit sometimes approaches that of *E. gracilis* with its basal tufted leaves, but the spikelets, and particularly the lemmas, are quite different.

Distribution.—Definitely related to the black soil plains of eastern Australia.

Queensland. Emerald, *Hubbard* 7930; Blackall, *Stringer* (Herb. Brisb.); Biloela, *Strong* A55; Mundubbera, *Bloxsome*; Dogwood Creek near Gurulmundi, *Belson* (Herb. Brisb.); Wallumbilla, *Belson*, also *Blunden* 11 (Herb. Brisb.); Picinjinnie near Wallumbilla, *Belson* (Herb. Brisb.) Mungallala, *Hubbard and Winders* 6066 (in part); MacAlister, *Hubbard and Winders* 6461; King's Creek, north of Warwick, *Young* 13.

New South Wales. Bogan River, *Mitchell* [type]; also *Mitchell* on 1835-6 expedition (Brit. Mus.).

9. *ENNEAPOGON NIGRICANS* (*R. Br.*) *Beauv.* Agrost. pp. 82 and 162 (1812). Desvaux in Journ. de Bot. 1, p. 70 (1813). Based on *Pappophorum nigricans* R. Br. in Prodrum, p. 185 (1810). It has been a confused species ever since the publication of Bentham's 'Flora Australiensis'. Domin (in Bibl. Bot. xx, p. 381; 1916) revived it as *P. nigricans* var. *Brownianum* Domin, but, unfortunately, included some material of *E. gracilis* (*R. Br.*) *Beauv.* in his list. Brown quoted the south coast, Port Jackson area and the north-east coast: but no south-coast specimens of his have been seen, though later collections show that the species occurs there. The north-east coast specimen has been separated as *Enneapogon arenicola* (Domin) N. T. Burbidge. The Port Jackson material has been taken as the type, though in actual fact it has a smaller inflorescence than the bulk of the material.

Description.—Perennial, tufted, glabrous or minutely glandular-pubescent. Culms rigid, erect, 3-5-noded; nodes bearded; internodes pubescent or glabrescent, finely striate. Leaves stiff; sheaths shorter than internodes; blades 7-14 cm. long, 2-3 mm. wide, finely striate and having long simple hairs, as well as this glandular pubescence on the upper surface, involute. Panicle lanceolate or linear-lanceolate, compact, spiciform, entire or interrupted, 3-7 cm. long, 1.5 cm. wide including the awns. Glumes lanceolate, acuminate or acute, membranous or scarious, 5-nerved, scabrid, usually sparsely glandular hairy, dark or straw-coloured; lower glume 4 mm. long, upper 5 mm. long. Fertile lemma shortly oblong, dorsally convex over the grain, 2 mm. long, ribbed by the nerves, though not so prominently as in *E. flavescens*, or almost smooth, thickly clothed in lower half with silky hairs (longer than in *E. gracilis*), and with a thin row of hairs inside below the awns, greyish with dark nerves or pale; awns pale greyish green or dark, plumose-ciliate in the lower two-thirds, 4-6 mm. long;

palea oblong, 2.5 mm. long, nerves ciliolate; anthers 0.75 mm. long; caryopsis ellipsoidal, 1 mm. long. *Sterile lemmas* with a palea in the lowest floret and the rest reduced to awns.

Distribution.—South and south-eastern Australia.

Western Australia. 'Swan River', *Drummond* 148 and 966; between Uladdie and Broad Arrow, *Moore* (Brit. Mus.); Fraser Range, *Dempster*.

South Australia. Mt. Lyndhurst, *Koch* 57 (in part) (Herb. Melb.); Kinchina, *Cleland* H315; Quorn, *Cleland* H318; below Belair, *Cleland* H319; Murray Bridge *Maiden* (also in Brit. Mus.); without precise locality, *Sturt* (Brit. Mus.), also *Mitchell* 52 and 69 (Brit. Mus.).

Queensland. Eidsvold, *Bancroft* (Brit. Mus.); between Tooburra and Rosehill, north of Warwick, *Hubbard* 5643.

New South Wales. Lachlan, *Cunningham* (Brit. Mus.); Port Jackson, *Brown* 6249 (in part) (type); Clifton, *Stuart*; without precise locality, No. 15 of the Grasses, *Cunningham*; *Woolls*, also *Whittet*; Fraser Exped. I., *Cunningham* (Brit. Mus.).

Victoria. Saint James, *Black* 1272. 929—(2); Dimboola, *Reader* (Herb. Melb.); Cuduaka, *Mueller*.

10. **Enneapogon arenicola** (*Domin*) *N. T. Burbidge*, stat. nov.

Pappophorum nigricans var. *arenicolum* Domin in Bibl. Bot. xx, p. 381 (1915) is based on a specimen collected by Tryon on South Percy Island. It is near *E. nigricans* (R. Br.) Beauv., and a Keppel Bay specimen was included by Brown in that species. Brown's specimen has a blackish panicle, while the rest of the material is pale greenish or straw-coloured. Colour is not a dependable character in this genus.

Description.—Perennial, tufted, with a pubescent base, 30–50 cm. high. *Culms* erect, vegetative ones short, those with panicles long and stouter, 3–5-noded; nodes bearded; internodes glabrescent, finely striate. *Leaves* minutely glandular pubescent, antrorsely scabrid; sheaths longer than internodes on vegetative culms, shorter on the fertile ones; blades more or less involute, 10–15 cm. long, 2–4 mm. wide. *Panicle* lanceolate, dense, spiciform, soft, the awns obscuring the glumes, 4–6 cm. long, 1.5–2.5 cm. wide, awns included. *Glumes* lanceolate, acuminate or acute or mucronulate, 5-nerved, membranous and quite glabrous; lower 3 mm., upper 4 mm. long. *Fertile lemma* oblong, dorsally convex over the seed, 1.8 mm. long, ribbed by the nerves, with long silky hairs developed from the base and lower half, and with the inside row of hairs extremely thin, pale in colour; awns pale green or straw-coloured, 5–6 mm. long, plumose-ciliate in the lower half, soft and obscuring the glumes; palea oblong ciliate on the nerves, 2 mm. long; anthers 0.75 mm. long; caryopsis 1.2 mm. long,

obovate, flattened or ellipsoid. *Sterile lemmas* glabrous, with a palea in the lowest floret, rest reduced to awns.

Distribution.—Confined to the east coast of Queensland.

Queensland. Palm Island, *Bancroft*; Magnetic Island, *White*; Ayr Beach, *Michael*; Bowen, *Hubbard and Winders* 6583; Hayman Island, *MacGillivray*; Middle Percy Island, *Tryon*; South Percy Island, *Tryon* (type); Percy Island, *MacGillivray* (Brit. Mus.); Keppel Bay, *Brown* 6249 (in part); Facing Island, ex Herb. Brisb.; Port Curtis, *MacGillivray*.

11. *Enneapogon robustissimus* (Domin) N. T. Burbidge, stat. nov.

Pappophorum nigricans var. *robustissimum* Domin in Bibl. Bot. xx, p. 381 (1915), is based on one of his own specimens, collected on the Flinders River at Hughenden, Queensland.

Description.—Perennial, with a very robust, loosely tufted habit, 50–80 cm. high. *Culms* stout, rigid and finely striate, 8–10 nodes; nodes softly bearded; internodes very pubescent below nodes to almost or quite glabrous above them. *Leaves* strongly retrorsely scabrid and sparsely pubescent, with simple hairs on the upper surface of the blades, sheaths shorter than internodes, blades 15–22 cm. long, 3–5 cm. wide, flat or slightly involute. *Panicle* lanceolate, dense, spiciform, soft, but the awns not obscuring the glumes, 5–8 cm. long, 1–2 cm. wide, including awns. *Glumes* elliptical-lanceolate, obtuse or mucronulate, 5–7-nerved, membranous, scabrid, but otherwise glabrous; lower glume 3 mm., upper 4 mm. long. *Fertile lemma* oblong, dorsally convex over the grain, 2 mm. long, ribbed by the nerves, its basal tuft of silky hairs as long as the lemma, and with a thin row of hairs inside below the awns, pale in colour; awns pale, 6–7 mm. long, plumose-ciliate in the lower half; palea oblong, ciliate on the nerves, 2.5 mm. long; anthers 1.25 mm.; caryopsis 1.5 mm. ellipsoidal. *Sterile lemmas* glabrous, the lowest floret with a palea, rest reduced to awns only.

Distribution.—Confined to north Queensland rivers. In sandy river beds.

Queensland. Gilbert River, *Bick*; Flinders River, Hughenden, *Domin* [type] (Herb. Domin); Mount Isa, in bed of Leichhardt River, *Winders* (in Herb. Hubbard 7410).

12. *ENNEAPOGON PALLIDUS* (R. Br.) Beauv. Agrost. pp. 82 and 161 (1812). Desvaux in Journ. de Bot. i, p. 70 (1815). Based on *Pappophorum pallidum* R. Br. in Prodrumus, p. 185 (1810). It was included in *P. nigricans* by Bentham. Domin in Bibl. Bot. xx, p. 381 (1915) made Brown's species the type for his *P. nigricans* var. *pallidum*. Unfortunately the specimens he included in the variety are a mixture.

The inflorescence is particularly variable in this species, but the spikelets are constant, and further division is not satisfactory.

Description.—Perennial, caespitose, 40–50 cm. high, pubescent at the base. *Calms* erect or ascending, rigid, slender, 4–6 nodes; nodes bearded; internodes pubescent or glabrescent, striate or later smooth. *Leaves* minutely glandular pubescent or almost glabrous, retrorsely scabrid; sheaths longer than or as long as the internodes; blades erect and involute or flat and spreading, 8–15 cm. long, 2–3 mm. wide. *Panicle* variable, linear or ovate and compact, or loosely branched and broadly ovate, in compact forms 3–7 cm. long, 1.5 cm. wide including the awns; loose forms 6–8 cm. long, 3–4 cm. wide. Young inflorescences enclosed in the uppermost leaf-sheaths. *Glumes* lanceolate, ovate-lanceolate or oblong, obtuse, 5–7-nerved scabrid, pubescent with simple and glandular hairs or glabrous, pale or greyish; lower glume 1.5–2 mm. long, upper 2–3 mm. *Fertile lemma* oblong, dorsally convex over the grain and the margins incurved over the palea at least in the earlier stages. If the seed is large in proportion to lemma then the palea may be forced out. Lemma 1.5–2 mm. long, ribbed by nerves and shortly hairy in the lower half to two-thirds, with a thin row of hairs inside, below the awns, pale in colour; awns pale, 2–4 mm. long, stiffly plumose-ciliate for the lower two-thirds; palea oblong or oblanceolate, sparsely pubescent, ciliate on the nerves, 2–2.5 mm. long; anthers 1.2 mm. long, pale or purplish; caryopsis 0.8 mm. long, oblong. *Sterile lemmas* glabrous, with palea in the lowest floret, rest reduced to awns.

Distribution.—Northern and eastern Queensland. Possibly south-western Australia.

Cunningham's specimen, labelled 'King George's Sound', is the only one from a non-Queensland locality. It seems too peculiar a distribution to accept without comment. In Cunningham's lists it is included with specimens from Cygnet Bay (King's Sound) and Prince Regent River—both in the Kimberley District of north Western Australia, and a few others from King George's Sound. The specimens are listed without special order and were evidently written up some time after collecting, as there was a visit to Mauritius between the collecting in the north and that in the south. The finding of *Enneapogon pallidus* in the far north of Western Australia would not be so surprising. It is to be hoped that future collections will make the position clearer.

Western Australia. King George's Sound, *Cunningham* 338 (King's Fourth Voyage of Survey).

Queensland. Carpentaria, *Brown* (ex Herb. Gay—*deduct* Brown [1824]); Carpentaria, *Brown* 6251; Sir Charles Hardy

Island, *Henne*; Chillagoe, *Domin* (Herb. Domin); Stannary Hills, *Bancroft*; Chudleigh Park Station, 110 miles north of Hughenden, *Hubbard and Winders* 7631; Mount Emu Plains Station, 64 miles north of Hughenden, *Hubbard and Winders* 7546; Gregory Springs Station, north of Hughenden, *Hubbard* (Herb. Brisb.); Gurulmundi, *Belson* (Herb. Brisb.), also and *Winders* 7711; Prairie, *Hubbard and Winder* 8747; Torrens Creek, *McCarthy* 13J (Herb. Brisb.) also *White* 8747, (Herb. Brisb.); Alpha, *Hubbard* 7871, 7868; between Rockhampton and Westwood, *White* 3389; Springsure, *Wuth* (labelled *Worth* in Brit. Mus.); Mundubbera, *Bloxsome* 3 (Herb. Brisb.); Gurulmundi, *Belson* (Herb. Brisb.), also *Hubbard* 5172; Chinchilla, *Beasley*, also *Hubbard and Winders* 6435; Mungallala, *Hubbard and Winders* 6088; Wallumbilla, *Blunden* 12 (Herb. Brisb.); Little Mount Edwards, *Everist* 552 (Herb. Brisb.); Goodna, *Blake* 181 (Herb. Brisb.).

12 a. ***Enneapogon pallidus* var. *breviseta* N. T. Burbidge.**

Differs from *E. pallidus* in its short dense inflorescence, 1–2 cm. long, 7–10 mm. wide, and in the short awned lemmas. Fertile lemmas 1.5 mm. long, awns 1–1.5 mm. long. The rest of the plant is as in *E. pallidus*. This variety approaches *E. Lindleyanus* (Domin) C. E. Hubbard, but the lemmas are dorsally convex. The panicles are greyish or straw-coloured.

***Enneapogon pallidus* (R. Br.) Beauv. var. *breviseta* N. T. Burbidge, var. nov.**

Gramen perenne. *Culmi* caespitosi, graciles, simplices, erecti, nodis barbatis. *Folia* pilis glanduliferis minutis pubescentia. *Paniculae* breves, compactae, 1–2 cm. longae, 7–10 mm. latae. *Glumae* glabrae, oblongae; inferior 2 mm. longa, superior 2.5 mm. longa. *Lemma* fertile 1.5 mm. longum; setae 1–1.5 mm. longae.

Queensland. Callide, Biloela, *Cowdray* 23 (type); Mundubbera, *Bloxsome* 35; Mt. Witheren, between Beaudesert and Canungra, *Brass*.

This variety has the erect tufted habit of *E. pallidus* (R. Br.) Beauv., with short, dense inflorescences and short-awned lemmas. The spikelets approach those of *E. Lindleyanus* (Domin) C. E. Hubbard, but are dorsally convex when the grain is mature.

13. ***Enneapogon Clelandii* N. T. Burbidge.** Based on specimens collected, in Central Australia, by Professor J. B. Cleland, while studying the food-habits of the aborigines, and named after him.

Description.—Perennial, pubescent or glabrescent at the base, loosely tufted or spreading, 30–60 cm. high. *Culms* erect, rigid, 4–6-noded, proliferating from the lower nodes; nodes bearded; internodes glabrous. *Leaves* glaucous, glabrous

or rarely sparsely pubescent with minute glandular hairs; sheaths finely striate; blades 8–15 cm. long, 3–4 mm. wide, involute or flat. *Panicle* ovate or elliptical-lanceolate, dense, spiciform, 2–4 cm. long, 1–1.5 cm. wide. *Glumes* oblong or oblong-lanceolate, obtuse or mucronulate, membranous, scabrid, pubescent with minute glandular hairs, dark-coloured, 2–7-nerved; lower glume 2–2.5 mm., upper 3 mm. long. *Fertile lemma* oblong, 2 mm. long, dorsally convex, ribbed by nerves, glabrous except for the lower third, and a very thin row of short hairs inside below the awns, hairs irregular in length, not more than two-thirds the length of the lemma, awns purplish or dark, 4 mm. long, stiffly plumose-ciliate in the lower two-thirds; palea 3 mm. long, nerves ciliate; anthers 1–1.25 mm. long, straw-coloured; caryopsis oblong, 1.5 mm. long. *Sterile lemmas* with a palea in the lowest floret, rest reduced to awns.

Distribution.—Central Australia.

Central Australia.—Mount Liebig, *Cleland* L23, L24 (type), L25; Ya-Ya Creek, *Cleland* L26; creek at Arltunga, *Cleland* H27; MacDonald Downs, *Chalmers* 3 in Herb. *Cleland* H527; without precise locality, *Gosse* 13.

Enneapogon Clelandii N. T. Burbidge, sp. nov.; affinis *E. pallido* (R. Br.) Beauv., sed culmis rigidis glabris, laminis glaucis distinguitur.

Gramen perenne, 30–60 cm. altum, basi pubescens vel glabrescens. *Culmi* erecti, multinodes, rigidi, nodis barbatis, internodiis glabris longis. *Folia* glabra vel glabrescentia; vaginae internodiis longiores vel demum aequales, inferiores pubescentes; ligulae ad seriem ciliorum redactae; laminae involutae vel planae, 8–15 cm. longae, 3–4 mm. latae, apice attenuatae, acutae. *Paniculae* terminales, erectae, ovatae vel oblongo-lanceolatae, 2–4 cm. longae, 1–1.5 cm. latae, densissimae, pedunculis longis. *Glumae* fuscae, scabridae, tenues, pilis glanduliferis minutis pubescentes, 5–7-nerves, oblongae, obtusae vel mucronulatae, 3–4 mm. longae, 1.5 mm. latae, subaequales, nervis superne scabridae. *Lemma* fertile striatum, oblongum, 2 mm. longum (setis exclusis), dorso convexum, basi villosum, marginibus ciliatis; setae 4 mm. longae, purpurascens vel fuscae, parte tertia superiore excepta rigide plumoso-ciliolatae. *Palea* 3 mm. longa, carinis ciliolata. *Antherae* 1–1.2 mm. longae, stramineae. *Caryopsis* 1.5 mm. longa, oblonga. *Lemmata sterilis* usque 0.75 mm. longa (setis exclusis), glabra, vel ad setas redacta.

This species proliferates from the lower nodes. Cleland states (Trans. and Proc. Roy. Soc. S. Austral. LVII, p. 118; 1933) that 'the plants are used to prevent the spilling of water out of a coolamon or pitchi when it is being carried, or as a strainer for débris, such as scum or leaves, before drinking'. Presumably, therefore, the plants are associated with waterholes and creeks, and this, with the presence of sand-particles on the roots, suggests that the plant can adjust itself to changing soil levels in the sand to be found in such habitats.

It is distinguished from *E. pallidus* (R. Br.) Beauv. by the more rigid habit, glabrous leaves, blackish glumes, and purplish or olive-green awns.

14. *ENNEAPOGON LINDLEYANUS* (Domin) C. E. Hubbard in Kew Bull. 1934, p. 450. *Pappophorum Lindleyanum* Domin in Bibl. Bot. XX, p. 379 (1915) was based on a specimen from Dampier Archipelago, off the north-west coast of Australia, collected by Walcot, though Domin's own specimens came from the north of Queensland. Unfortunately there are two specimens labelled 'Dampier Archipelago—Walcot' in the Kew Herbarium. One of these agrees with the description of *P. Lindleyanum* var. *convolutum* Domin, loc. cit. p. 380, which is the first variety given, while the other is a more robust plant, and is included under *Enneapogon oblongus* N. T. Burbidge.

Pappophorum Lindleyanum var. *convolutum* Domin (loc. cit.) is a synonym.

The species is a difficult one to define. Some of the specimens approach the smaller forms of *Enneapogon pallidus* in spikelet shape, others are very close to small forms of *E. oblongus*. These two species are themselves quite distinct. It is only with depauperate and short-panicled specimens that difficulties arise. *E. pallidus* has a much more erect habit, and does not branch freely from the upper nodes as commonly as the other two species.

Description.—Perennial, tufted and spreading, 15–40 cm. high. Culms erect or geniculately ascending, slender, 5–8-noded, much branched from the upper nodes, nodes bearded, internodes often almost glabrous later, smooth and shining. Leaves pubescent with minute glandular hairs or almost glabrous; sheaths slightly longer than the internodes and, owing to the branching, often free; blades stiffly spreading, 4–8 cm. long, 1.5–2 mm. wide, tightly involute, rarely unrolled. Panicle smaller than in any other Australian species, linear, elliptical or ovate, very compact, spiciform, usually 1–2 cm. long, though the limits among the specimens available are 0.5–3 cm., exserted on a long peduncle. Glumes oblong, very obtuse, mucronulate or ragged at the apex, membranous, 3–5-nerved, glabrous or scantily pubescent with few simple and glandular hairs; lower glume 1.5 mm., upper 2 mm. long. Fertile lemma more or less cuneate, especially in side view, owing to the straight back, which does not curve in above the seed, margin ciliate as in other species, and incurved, 1.5–2 mm. long, well ribbed by the thickened nerves, with a tuft of silky hairs developed in the lower third, as long as the lemma, and a very thin row of short hairs inside below the awns; awns short and stiffly spreading, 1.5–2 mm. long,

stiffly plumose-ciliate almost to the tip or for at least two-thirds; palea not enclosed by the lemma as in *E. pallidus*, 2 mm. long, pubescent or glabrous, ciliate on the nerves; anther 1.5 mm. long; caryopsis 1-1.25 mm. long, oblong. *Sterile lemmas* glabrous, with a palea in the lowest floret, rest reduced to awns.

Distribution.—Northern and central Australia. In open rocky soils.

Western Australia. Dampier Archipelago, *Walcot* (type).

South Australia. Cockatoo Creek, *Cleland* H385; East MacDonald Range near Arltunga, *Pulleine*; Hermannsburg, *Hill* 69, also *Cleland* H107; without precise locality, *Gosse* 177.

Queensland. Gilbert River, *Brass* 8796; Chillagoe, *Domin* (Herb. *Domin*); Townsville, *Weston*, also *Domin* (Herb. *Domin*), *Hubbard and Winders* 6630; Cloncurry, *Domin* (Herb. *Domin*), also *Hubbard* 7320; Rockhampton, *O'Shanesy* (Herb. Melb.); Dogwood Creek, near Gurulmundi, *Belson* (Herb. Brisb.); King's Creek, *Bowman*; 'Sandy Cape and Port Bowen', *MacGillivray* 99.

15. *Enneapogon pubescens* (*Domin*) *N. T. Burbidge*.

Pappophorum Lindleyanum var. *pubescens* *Domin* in *Bibl. Bot.* xx, p. 380 (1915), is distinguished by *Domin* from *P. Lindleyanum* var. *convolutum* *Domin*, loc. cit., by the pubescent leaves. However, the larger amount of material now available shows this variety to be a distinct and more vigorous grass than var. *convolutum*.

P. Lindleyanum var. *scaberrimum* *Domin*, loc. cit., is a mixture. Some of *Domin*'s material is *Enneapogon pallidus*, and the rest a vigorous form of *E. pubescens*.

Amongst *Domin*'s material lent to Kew there is no specimen labelled *Pappophorum Lindleyanum* var. *pubescens*. But there is a specimen, labelled var. *convolutum*, which is unaccounted for in his list of localities of the latter variety, but fits that given for var. *pubescens* and agrees with the description. This has been used as the type.

Description.—Perennial, densely tufted, very pubescent, 30-40 cm. high. Culms slender, erect or spreading, 5-8 nodes, nodes bearded, branching from the upper nodes, but not so frequently as in *E. Lindleyanus*, internodes pubescent or glabrescent. Leaves pubescent with long simple hairs mixed with minute glandular ones, also retrorsely scabrid; sheaths striate; blades spreading, striate, 6-15 cm. long, 2-3 mm. wide, flat, or partly or quite involute. Panicles as in *E. Lindleyanus*, but 2-4 cm. long. Glumes oblong or oblong-lanceolate, very obtuse, membranous, 3-7-nerved, scabrid or glabrous; lower 2-2.5 mm., upper 2.5-3 mm. long. Fertile lemma as in *E. Lindleyanus*, but 2-2.5 mm. long; awns 2-3 mm. long,



FIG. 4.—*Enneapogon pubescens*. 1, a plant, reduced to 0.75; 2, a ligule, $\times 3$; 3, a spikelet, $\times 3$; 4, the lower glume, $\times 9$; 5, the upper glume, $\times 9$; 6, a pair of florets, $\times 6$; 7, a lemma with the hairs removed, $\times 9$; 8, the same from inside, $\times 9$; 9, palea from outside, $\times 9$; 10, the same from inside, $\times 9$; 11, the same from the side, $\times 9$; 12, a flower, $\times 9$; 13, lodicules, $\times 9$; 14, a caryopsis, $\times 9$. Drawn from Hubbard 6763.

plumose-ciliate almost to the tip, stiff; palea oblong, pubescent, ciliate on the nerves, 3 mm. long, free from the lemma when grain is mature; anthers 1.5 mm. long; caryopsis 1 mm. long, oblong (fig. 4).

Distribution.—North Queensland. Rocky open ground.

Queensland. Gilbert River, *Brass* 1855, also *White* 1493; Chillagoe, *Domin* [type] (Herb. Domin), also *Hubbard and Winders* 6763; Metal Mountains near Chillagoe, *Domin* (Herb. Domin); between Boonmoo and Dimbulah, *Hubbard and Winders* 6859.

The Gilbert River specimens are robust, erect and rigid, probably due to favourable conditions.

16. *Enneapogon oblongus* N. T. Burbidge. Based on a specimen from Mount Sturgeon Station, north of Hughenden, collected by Hubbard. The name refers to the shape of the panicle.

Pappophorum nigricans var. *barbinode* Domin in Journ. Linn. Soc. Lond., Bot. XLI, p. 277 (1912), is a synonym. Clement's specimen is a stunted plant and the panicles are not fully developed.

P. Lindleyanum var. *glaucum* Domin in Bibl. Bot. xx, p. 380 (1915) is also a synonym. *P. Lindleyanum* var. *laguroides* Domin, loc. cit., is another synonym. This latter variety was based on a specimen collected between Longreach and Ilfracombe. It differs in being a weaker, though not a shorter plant, and in not having glaucous foliage. It has the appearance of a variation due to an unusual habitat.

Description.—Perennial, loosely tufted and spreading, 20–40 cm. high. *Culms* slender, erect or geniculately ascending rigid, 6–8-noded; nodes bearded; frequently branching from the upper nodes, though not so much so as in many other species; internodes smooth, pubescent when young, but soon becoming glabrous and shining. *Leaves* light green, glaucous, glabrous except for the upper surfaces of the blades, which may be sparsely covered with long simple hairs, or both blades and sheaths may be pubescent with minute glandular hairs as well as the above-mentioned simple hairs; sheaths longer than or as long as the internodes and commonly free from them owing to the axillary branches; blades flat or involute, 8–20 cm. long, 2–4 mm. wide, apex attenuate. *Panicle* oblong, compact, spiciform, with the spikelets standing out at right angles to the rhachis. *Glumes* oblong or lanceolate, very obtuse, 5–9-nerved, pubescent with simple and glandular hairs, pale, lower 3–3.5 mm. long, upper 3.5–4 mm. long. *Fertile lemmas* one or two per spikelet, dorsally straight but the ciliate margin curved so that in side view the lemma appears asymmetrically cuneate, nerves very prominent and

very occasionally with an extra pair, not connected with an awn, on either side of the central nerve, which is more prominent than its fellows; lowest lemma with a basal tuft of long silky hairs and short hairs inside just below the awns, 2.5–4 mm. long; second fertile lemma glabrous, and smaller in proportions; awns rigid, very divergent at maturity, stiffly plumose-ciliate almost or quite their whole length, central awn larger than its neighbours, all from 3–6 mm. long; palea free from the lemma, obovate-oblong, 3–4 mm. long, nerves ciliolate, pubescent except for a bare patch at the apex between the nerves; anthers 1 mm. long; caryopsis oblong, 1.5 mm. long (in second floret smaller). *Sterile lemmas* with a palea in the lowest floret, rest reduced to awns.

Distribution.—Mostly northern Australia. In stony soils on small hills or in gullies. Cleland's specimens are from a very southern locality and have smaller spikelets, but without further material and information they cannot be separated as a distinct form.

Western Australia. Port Hedland, *Fitzgerald* 51, 44; Dampier Archipelago, *Walcot*; Marble Bar, *Stewart*; Mount Edgar Station, near Marble Bar, *Stewart*; between Ashburton and De Grey Rivers, *Clement*.

South Australia. Flinders Range, *Cleland* S.A.23/37, S.A.24/37.

Queensland. Mount Sturgeon Station, north of Hughenden, *Hubbard and Winders* 7745 (type); Fairlight Station, north of Hughenden, *Hubbard and Winders* 7482; Hughenden, *Hubbard and Winders* 7182, also *Hawthorn*; Cloncurry, *Domin* (Herb. Domin); Mount Isa, *MacCallum*, also *Winders* (Herb. Hubbard 7395); Duchess, *Hubbard* 7366; between Longreach and Ilfracombe, *Domin* (Herb. Domin); without precise locality, *Plant*.

Enneapogon oblongus N. T. Burbidge, sp. nov.; affinis *E. Lindleyano* (Domin) C. E. Hubbard et *E. caerulescenti* (Gaudich.) N. T. Burbidge, sed culmis robustioribus, paniculis majoribus, foliis glaucis differt.

Gramen perenne, caespitosum, 20–40 cm. altum, basi pubescens vel glabrescens. *Culmi* erecti vel geniculato-ascendentes, 6–8-nodes, e nodis ramosi, nodis barbatis, internodiis glabrescentibus laevibus. *Folia* subviridia, glauca, glabra vel raro pubescentia vel pilis glanduliferis minutis pubescentia, scaberrima; vaginae laxae, internodiis longiores; ligulae ad seriem ciliorum redactae; laminae lineares, divaricatae, 8–20 cm. longae, 2–4 mm. latae, involutae vel planae, apice attenuatae. *Paniculae* terminales, oblongae vel ovatae, continuae, spiciformes, 1.5–3.5 cm. longae, 1.5 cm. latae (setis inclusis), exsertae; rhachis et rami pubescentes. *Glumae* oblongae vel lanceolatae, obtusae, 5–9-nerves, pilis simplicibus et glanduliferis pubescentes, papyraceae, pallidae, demum stramineae; inferior 3–3.5 mm., superior 3.5–4 mm. longa. *Lenmata fertilia* 1–2, subcuneata, nervis prominentibus, dorso recta, marginibus ciliata; lemma inferius e basi villosum, 2.5–4 mm. longum (setis exclusis); lemma superius glabrum, 2–2.5 mm. longum; setae rigidae, divaricatae, plumoso-ciliatae, inaequales, 3–6 mm. longae. *Palea* obovato-oblonga, 3–4 mm. longa, carinis ciliolata, parte tertia superiore

excepta pubescens. *Antherae* 1 mm. longae. *Caryopsis* oblonga, 1.5 mm. longa. *Lemmata sterilia* usque 0.75 mm. longa vel ad setas redacta.

17. *Enneapogon caerulescens* (Gaudich.) N. T. Burbidge.

Pappophorum caerulescens Gaudich. in Freyc. Voy. Bot. p. 409 (1826). Gaudichaud's material at Kew is very poor, but there is a better specimen at the British Museum which shows the base of the plant. It has rather stouter culms than those of the majority of the material available, but the panicles and spikelets compare satisfactorily.

Description.—Annual (or possibly behaving as a perennial when conditions are favourable), densely tufted small plant or erect and 15–40 cm. high. *Culms* erect or spreading and ascending, slender, 3–4-noded; nodes bearded; internodes glabrescent, very short in dwarf plants, or up to 4 cm. in taller specimens. *Leaves* scabrid, pubescent with minute glandular hairs; sheaths longer than the internodes, with axillary inflorescences in the basal sheaths; blades narrow linear, flat, or more or less involute, pubescent with long simple hairs on the upper surface, in dwarf plants 1–5 cm. long, in taller specimens 5–15 cm. long, but in either case only 1–2 mm. wide, apex filiform. *Panicle* terminal, ovate or cylindrical and oblong, 1–3 cm. long, 8 mm. wide including the awns. *Spikelets* dark-coloured, later straw-coloured or rarely purplish. *Glumes* lanceolate or oblong-lanceolate, acute or almost obtuse, pubescent with simple and glandular hairs, 5–9-nerved, size variable in each inflorescence, those towards the apex being in some cases nearly twice as long as the basal ones even when the latter are mature, size also variable in different specimens, coarser specimens having larger glumes, lower glumes varying from 3–5.5 mm. in majority of specimens (coarser specimens 3.5–7 mm.), upper glume 3.5–6 mm. (or 5–7.5 mm.). *Fertile lemma* oblong, 1.5 mm. long, but varying slightly with the difference in spikelet-size, pale, texture rather thin even at maturity, its nerves prominent, often dark, or more rarely reddish, the whole surface obscured by the thick tuft of long silky hairs developed from the basal third, a thin row of hairs inside just below the awns; awns blackish, later straw-coloured, or rarely reddish, softly ciliate in the lower two-thirds, 4–6 mm. long; *palea* oblanceolate or elliptical, membranous, 2 mm. long, with ciliate nerves; *anthers* 0.4–0.5 mm. long; *caryopsis* oblong or obovate, 1 mm. long. *Sterile lemmas* about 0.5 mm. long and with a palea in the lowest floret, rest reduced to awns only. Axillary cleistogamous inflorescences of 3–5 spikelets, the lower number the more usual, present in basal sheaths; terminal spikelet fertile and maturing first, lower ones fertile, male or sterile, but backward in development. *Glumes* linear lanceolate, pubescent to villous, with long simple hairs, 7–9-nerved, lower 4 mm.,

upper 6 mm. long (in lower spikelets slightly smaller). *Fertile lemma* as in chasmogamous spikelets, but basal hairs shorter, 1.5–2 mm. long; awns 1.5–2 mm. long; palea 2–3 mm. long, pubescent; anthers 0.5 mm. long; caryopsis 1.5 mm. long, obovate. *Sterile lemmas* as in chasmogamous spikelets.

In other species there is a less well-marked difference in the size of the spikelets within the inflorescence, but this disappears as the lower ones mature.

There are two forms worth commenting upon. Firstly, two specimens from the Roebourne area have purplish awns—whereas in the rest of the material they are black or straw-coloured—and secondly, there are a few specimens with rather more robust habit and larger glumes (see under description). Melville's specimen from Desert Well comes under this heading.

Distribution.—Western and South Australia. Definitely related to the Mulga (i.e. *Acacia* Semi-desert Scrub) zone. As the rainfall is particularly unreliable in these areas, the cleistogamous habit is of special significance, as also is the fact that the species is capable of behaving as a short-lived perennial. The two Roebourne specimens do not come from Mulga country.

Western Australia. Nichol Bay, *Jarvis*; Warambie Station, Roebourne, *Meares*; Wandagee Station, Minilya River, *Gooch*; Sharks Bay, *Gaudichaud* (type); south of Desert Well, *Melville*; Boolardy Station, Murchison River, *Lefroy*; Coodardy Station, Cue, *Lefroy*; Wilson Pool, *Moore* (Brit. Mus.); Glenorn Station, Malcolm, *Burbidge* 337, 338; Pindinni, 79 miles ENE. of Menzies, *Helms*; Yundamindra Station, Lake Carey, *Pearse*; Laverton, *Gardner*; Mulline, *Maryon* (Brit. Mus.); without precise locality, *Cunningham*.

South Australia.—Mount Lyndhurst, *Koch* 57 in part (Herb. Melb.); Flinders Range, *Cleland* S.A.17/37, S.A.19/37, S.A.21/37; between Blimnan and Wirralpa, *Cleland* H12; Barton, *Hubbard* 8344.

18. *ENNEAPOGON ASPERATUS* C. E. *Hubbard* in Hook. Ic. Pl. t. 3337 (1937).

Description.—Perennial, densely tufted, pubescent at the base, 15–40 cm. high. *Culms* numerous, erect or geniculately ascending, rigid, many-noded; branching from the upper nodes common, disarticulating at the nodes so as to release the grain from the axillary inflorescences; nodes bearded; internodes pubescent or glabrescent. *Leaves* pubescent with simple and glandular hairs, antrorsely scabrid, finely striate; sheaths longer than the internodes, the upper ones enclosing or partly enclosing axillary inflorescences whose spikelets behave cleistogamously; blades linear, acutely attenuate, 3–9 cm. long, 1–3.5 mm. wide, closely involute. *Panicle*

terminal, exserted, cylindrical, spiciform, entire or interrupted at the base, 1.6 cm. long, 4–9 mm. wide ; also smaller panicles in the axils of the leaves. *Glumes* lanceolate or oblong, obtuse, 5–7-nerved, nerves scabrid, scarious, pubescent with simple and glandular hairs, subequal, 2.2–3 mm. long (in cleistogamous spikelets 4 mm.). *Fertile lemma* oblong, dorsally convex, 1–1.6 mm. long (in cleistogamous spikelets 2 mm.), ribbed by the nerves, pubescent with silky hairs as long as or longer than the lemma, and with a thin row of hairs inside just below the awns ; awns pale, 1.5–2.5 mm. long, in the lower two-thirds rigidly plumose-ciliate ; palea narrowly oblong, 1.7–2 mm. long, nerves ciliolate ; anthers 0.4–0.7 mm. long ; caryopsis oblong, 1–2 mm. long. *Sterile lemmas* with a palea in the lowest floret, rest reduced to awns.

Distribution.—Known only from the type-locality.

Queensland. Gregory North District ; Duchess, 'very abundant on reddish-brown soil. Feb. 1931', Hubbard 7348.

19. *Enneapogon cylindricus* N. T. Burbidge, sp. nov.

The name refers to the cylindrical panicle.

Description.—Perennial, tufted, from a very pubescent or villous base, 20–35 cm. high. *Culms* erect, 3–4-noded, sterile ones short, fertile one robust and long ; nodes bearded ; internodes pubescent or glabrescent, finally disarticulating at the nodes. *Leaves* with large loose sheaths, of which those of the lower leaves are villous and those of the upper pubescent with both simple and glandular hairs ; blades narrower than the sheaths and 8–15 cm. long, 1–1.5 mm. wide with axillary cleistogamous inflorescences in the upper axils, partly or wholly enclosed and single cleistogamous spikelets in the lower axils. Terminal *panicle* exserted, narrow cylindrical, spiciform, entire or interrupted at the base, 6–14 cm. long, 5–10 mm. wide including awns. Axillary inflorescences short and with few spikelets. The spikelets in these two types of inflorescence are similar in shape and size, but a third type is to be found in the lower axils. Types I and II : *Glumes* lanceolate, obtuse or acuminate or mucronulate, subequal, 2.5–3.5 mm. long, 5–7-nerved, scarious, minutely glandular pubescent, finely scabrid on the larger nerves. *Fertile lemma* oblong, dorsally convex over the grain, 1.8–2 mm. long, ribbed by the nerves, villous in the lower half, with silky hairs as long as the lemma, and with a very thin row of short hairs inside below the awns ; awns dark or straw-coloured, 2.5–4 mm. long, stiffly ciliate in the lower half ; palea oblong, pubescent, 1.9–2 mm. long, nerves ciliolate ; anthers 0.5 mm. long ; caryopsis 1–1.25 mm. long, oblong. *Sterile lemmas* with a palea in the lowest floret and the rest reduced to awns only. Type III : *Glumes* linear or lanceolate, acuminate or acute, villous or glabrescent, thinly membranous, 6–7 mm. long. *Fertile lemma* ovate,



FIG. 5.—*Enneapogon cylindricus*. 1, a plant reduced to 0.75; 2, a ligule, $\times 3$; 3, a spikelet, $\times 3$; 4, the lower glume from within, $\times 6$; 5, the upper glume from within, $\times 3$; 6, a pair of florets, $\times 6$; 7, the lemma with its hairs removed to show the ribs, $\times 6$; 8, the same from within, $\times 6$. 9, palea with caryopsis and old anthers enclosed, $\times 9$; 10, palea from the side, $\times 9$; 11, androecium and gynoeceum of the flower, $\times 9$; 12, lodicules, $\times 9$; 13, a caryopsis at maturity, $\times 9$; 14–20, parts of a cleistogamous spikelet; 14, lower glume from the side, $\times 6$; 15, upper glume from the side, $\times 6$; 16, lemmas, $\times 6$; 17, a lemma flattened and from the inside, $\times 6$; 18, palea from the back, $\times 9$; 19, the same from the side, $\times 9$; 20, the same with a caryopsis and remains of anthers enclosed, $\times 9$. Drawn from Wade 26.

gibbous, indurated, 2-4.5 mm. long, nerves not prominent though visible at the apex, villous in the broad swollen portion, glabrous above; awns very short, 1-2 mm. long and minutely ciliate; palea oblong or broadly oval, with wide membranous margins beyond the ciliolate nerves, pubescent 2.5-3 mm. long; caryopsis oblong, 1.5-2 mm. long (fig. 5).

Distribution.—Sandy soils in semi-desert of Western and South Australia.

Western Australia. Yundamindra Station, Lake Carey, *Pearse*.

South Australia. Blood's Creek, *Cleland* H313; Lake Eyre, *Andrews* 68; Frome Downs, *Wade* 26 (type); Curnamona, *Cleland* H18; Koonamore Vegetation Reserve, *Paltridge* 28; without precise locality, *Oldfield*.

Enneapogon cylindricus N. T. Burbidge, sp. nov.: affinis *E. asperato* C. E. Hubbard, sed paniculis longioribus, spiculis cleistogamis in axillis vaginarum inferiorum ortis distinguitur.

Gramen perenne, 20-35 cm. altum, basi pubescens. *Culmi* steriles erecti, 3-4-nodes, internodiis brevioribus. *Culmi* fertiles erecti, robustiores, 3-4-nodes, nodis pubescentibus vel villosis, internodiis longis pubescentibus vel pedunculo demum glabrescente, e nodo summo disarticulantes, panícula exserta terminati, praeterea paniculas breves in axillis vaginarum superiorum gerentes. *Folia* scaberrima; vaginae internodiis longiores, inferiores pubescentes vel villosulae, latiores, explanatae, spiculas cleistogamas solitarias in axillis gerentes, superiores scaberrulae vel pubescentes, tenuissime striatae; laminae anguste lineares, 8-15 cm. longae, erectae, involutae, explanatae, usque 1-1.5 mm. latae, rigidae, puberulae, apice tenuiter acuminatae. *Paniculae* terminales, cylindricae, continuae vel basi interruptae, 6-14 cm. longae, 5-10 mm. latae, spiculas chasmogamas gerentes. *Paniculae* axillares graciles, in vaginis superioribus inclusae vel demum leviter exsertae, spiculas cleistogamas gerentes. *Spiculae* chasmogamae: *glumae* lanceolatae, obtusae vel acuminatae vel mucronulatae, subaequales, 2.5-3.5 mm. longae, 5-7-nerves, tenuiter papyraceae, scaberrimae, pilis minutis glanduliferis pubescentes, nervis superne scabridae; *lemma* fertile elliptico-oblongum, 1.8-2 mm. longum (setis exclusis), striatum, prominenter nerve, basi villosum; setae 2.5-4 mm. longae, parte tertia superiore excepta scaberula rigide ciliatae; *palea* 1.9 mm. longa, pubescens, carinis ciliolata; *lemmata* sterilia usque 0.5 mm. longa (setis exclusis); *antherae* 0.5 mm. longae; *caryopsis* 1-1.2 mm. longa, oblonga. *Spiculae* panicularum axillarum illis terminalium similes. *Spiculae* cleistogamae in vaginis inferioribus gestae quam ceterae majores: *glumae* lineares, lanceolatae, villosae vel glabrescentes, tenuiter membranaceae, 3-3.5 mm. longae; *lemma* fertile ovatum, gibbosum, demum induratum, 2-2.5 mm. longum; setae 1-2 mm. longae vel breviores, minute ciliolatae; *palea* pubescens, 2.5-3 mm. longa, carinis ciliolata; *lemmata* sterilia minora, ad setas redacta; *caryopsis* oblonga, 1.5-2 mm. longa.

The species is easily recognized by its basal tuft of leaves, long narrow panicle and three types of spikelets.

My thanks are due to the Director of the Royal Botanic Gardens for permission to work at the Kew Herbarium, and also to various members of the staff of the Herbarium for much advice and helpful criticism.

CONTRIBUTIONS TOWARDS THE FUNGUS FLORA OF UGANDA*.—IV. THE USTILAGINALES OF UGANDA.

By G. C. AINSWORTH, Imperial Mycological Institute,
Kew, Surrey.

IN 1920, Miss E. M. Wakefield in her 'Notes on Uganda Fungi' (Kew Bull. 1920, pp. 289-90) listed 10 species of the Ustilaginales from Uganda. The present list, compiled at the suggestion of Mr. C. G. Hansford, is based on an examination of all the available specimens from Uganda which have, whenever possible, been compared with authentic material. Of the 25 species recorded, three are previously undescribed.

The first extensive mycological collection from Uganda was that of R. A. Dummer, and his accession numbers are given for the specimens he collected. For the more recent collections the number under which the specimen is recorded in the Herbarium of the Mycologist, Department of Agriculture, Uganda (e.g. U.2104), is given.

I am indebted to the Director of the Royal Botanic Gardens, Kew, for allowing me access to specimens in the Herbarium, and to Mr. E. W. Mason for help and advice.

CINTRACTIA AXICOLA (Berk.) Cornu in Ann. Sci. Nat. Bot. ser. 6, xv, p. 279 (1883). On *Fimbristylis*? *diphylla* (Retz.) Vahl, Entebbe Road (Hansford, June 1937, U.2104).

CINTRACTIA LIMITATA Clinton in Proc. Boston Soc. Nat. Hist. xxxi, p. 399 (1904). On *Mariscus Dregeanus* Kunth, Serere Teso (Hansford, June 1933, U.1644); on *M. macer* Kunth, Serere Teso (Hansford, Oct. 1932, U.1602); on *M. Sieberianus* Nees, Serere Teso (Hansford, May 1933, U.1639); on *M. umbellatus* Vahl, Mile 13, Entebbe Road (Hansford, Nov. 1937, U.2267).

A specimen of *Cintractia* [previously recorded as *C. axicola*] on *M. umbellatus* from Kijude (Dummer 2516, July 1915), which shows sori in the spikelets and also on the peduncles has been omitted from this list. Spores from the peduncles and spikelets are similar in appearance. In size, 10-14 (av. 12) μ , they are smaller than those of *C. axicola* (11-18 (av. 14) μ) and agree with those of *C. limitata* (10-14 (av. 11-12) μ) and *C. peribebuyensis* Speg. (10-14 (av. 11-12) μ). Infection is confined to the spikelets in *C. limitata*, but there is no record from Uganda of *C. peribebuyensis* (the sori of which, like those of *C. axicola*, occur on the peduncles and rarely in the spikelets), and the sori of the specimen are too mature to assist identification.

* For Part I see Journ. Linn. Soc. Lond., Bot. LI, p. 265; for Part II, the same, p. 537; and for Part III, these Proceedings, p. 4 above.

ENTYLOMA AUSTRALE Spegazzini in Anal. Soc. Cien. Argent. x, p. 5 (July 1880). Syn. *Entyloma Physalidis* (Kalch. & Cooke) Winter. On *Physalis peruviana* Linn., Entebbe Road (Hansford, May 1938, U.2412); Kampala (Hansford, May 1938, U.2421); Kawanda (Hansford, Aug. 1939, U.2538); on *Physalis* sp., Entebbe Road (Hansford, May 1936, U.1818).

ENTYLOMA DAHLIAE H. & P. Syd. in Ann. Mycol. Berl. x, p. 36 (1919). On cultivated *Dahlia* sp., Kampala (Chandler, Oct. 1938, U.2537).

MYCOSYRINX CISSI (DC.) Beck in Ann. Nat. Hofmus. Wien, ix, p. 123 (1894). On *Cissus* sp., Kiserema (Dummer 617, Nov. 1913) [previously recorded as *Schroeteria Cissi* (DC.) de Toni]; Entebbe Road (Hansford, March 1938, U.2391).

SOROSPORIUM REILIANUM (Kühn) McAlpine, Smuts of Australia, p. 181 (1910). On *Sorghum vulgare* Pers. (native millet), foot hills of Mt. Elgon (Small 165, Nov. 1914) [previously recorded as *Sphacelotheca Reiliana* (Kühn) Clinton]; on *Sorghum* ? *verticilliflorum*, Masindi (G. Clay, June 1925, Small 684).

SOROSPORIUM TEMBUTI Pole-Evans & P. Hennings in Engl. Bot. Jahrb. xli, p. 270 (1908). On *Hyparrhenia cymbaria* Stapf, 'Luala' (Dummer 4282, Sept./Oct. 1919); on *H. dissoluta* (Steud.) Hubbard (= *H. Ruprechtii*), Bukasa Sesse (Dec. 1927), Koja (Jan. 1928) (Hansford, U.868).

The spores of these two specimens are slightly smaller than those of the Kew co-type of *S. Tembuti* on *Hyparrhenia Tamba* (Tembuti grass) from the Transvaal, 9–12 (av. 10.4) μ and 8–12 (av. 10.7) μ , respectively, compared with 10–13 (av. 12.2) μ ; and the echinulations on the free surface of their outer spores are less well developed. In view, however, of their close similarity to *S. Tembuti* they are, pending further collections, included here in that species.

✓ **Sorosporium Hansfordii** Ainsworth, sp. nov.

Sori ovaria destruentes, inter glumas aliquanto occulti, cylindrici, utrinque teretes, 1–1.5 cm. longi, ad 1.5 mm. lati, membrana robusta crenea apicem prope dehiscenti vestiti. *Massa sporarum* fusco-brunnea vel atra, fasciculos plures (ad 15) longos fusco-brunneos includentes. *Glomeruli* subglobosi vel oblongi, opaci, modice firmi, e sporis pluribus constituti, 50–150 μ longi. *Sporae centrales* globosae vel polygoniae, tunica tenui praeditae, pallido-coloratae; *sporae periphericae* globosae vel subglobosae, aliquando modice angulatae, tunica crassa peripherice papillata praeditae, castaneae, 7–11 (in medio 9) μ diam.

Hab. in ovariis *Hyparrheniae Pilgerianae*; Kabaroni, Elgon, Uganda (C. G. Hansford, U.1721 typus).

Sori destroying the ovaries and causing a witches' broom effect in infected inflorescences, partially hidden by the

glumes, cylindrical, tapering at both ends, 1-1.5 cm. long, maximum diam. 1.5 mm., each covered by a well-developed cream-coloured membrane which dehisces apically to expose a number (up to 15) of long dark brown threads of host tissue; spore balls sub-globose to oblong, opaque, rather permanent, many-spored, 50-150 μ long; inner spores spherical to polyhedral, thin-walled, smooth, pale in colour; outer spores globose to subglobose, sometimes somewhat angular, thick-walled, free surface papillate, reddish-brown, 7-11 (av. 9) μ in diam.

On *Hyparrhenia Pilgeriana* Hubbard, Kabaroni, Elgon (Hansford, Dec. 1933, U.1721). Type-specimen in the Herbarium of the Imperial Mycological Institute.

Sphacelotheca dolichosora Ainsworth, sp. nov.

Sori inflorescentias destruentes, cylindrici, utrinque modice teretes, 4-11 cm. longi ad 1-2 mm. lati, membrana robusta grisea vel griseo-brunnea prope apicem deficienti vestiti. *Massa sporarum* fusco-brunnea, pulverulenta, fasciculos vasculares prope 6 includens. *Cellulae steriles*, globosae vel subglobosae, saepe modice angulatae, ordinatim dispositae, 6-12 μ longae ad 6 μ latae. *Sporae* globosae vel subglobosae, saepe modice angulatae, verruculosissimae, flavo-brunneae, vacuolatae, 8-12 (in medio 10) μ diam.

Hab. in inflorescentiis *Digitariae longiflorae*; Entebbe, Uganda (L. C. C. Liebenberg, U. 1078 typus).

Sori destroying the inflorescences, cylindrical, slightly tapered at both ends, 4-11 cm. long, 1-2 mm. in diam., each covered by a well-developed grey to grey-brown membrane which disintegrates from the apex to expose a dark brown dusty spore mass surrounding a number (6 or more) of strands of host tissue; sterile cells hyaline 6-12 μ long by about 6 μ broad arranged in rows; spores globose to subglobose but often somewhat angular, abundantly verruculose (under oil-immersion), dark yellowish-brown, vacuolate, 8-12 (av. 10) μ in diam.

On *Digitaria longiflora* (Retz.) Pers., Entebbe (L. C. C. Liebenberg, Feb. 1930, U.1078). Type-specimen in the Herbarium of Imperial Mycological Institute.

SPHACELOTHECA CONGENIS (H. & P. Syd.) Wakef. in Zundel, Mycologia, xxii, p. 140 (1930). On *Hyparrhenia diplandra* Stapf, low grassy swamp land, Kipayo (Dummer 1118, Oct. 1914); Nagunga (Dummer 3053, Dec. 1916); Koja Kiagwe (J. T. Kennedy, Jan. 1928, U.867); Kisubi, Entebbe (Hansford, Dec. 1937, U.2297); Kawanda (Hansford, March 1940, U.2562).

SPHACELOTHECA CRUENTA (Kühn) Potter, Phytopathology, II, p. 98 (1912). On *Sorghum vulgare* Pers., Kampala (Small, May 1921, U.574); Wallasi, Bugishu (J. D. Snowden, Oct. 1927, U.865); on *S. verticilliflorum* Stapf, Kampala (Hansford,

Jan. 1928, U.871) ; on *S. ? halepense* Pers., grassland, Kipayo (Dummer 1324, Nov. 1914) [previously recorded as *Sphacelotheca Sorghi* (Link) Clint.].

SPHACELOTHECA SCHWEINFURTHIANA (Thüm.) Sacc. in Ann. Mycol. Berl., vi, p. 554 (1908). On *Imperata arundinacea* Cyrilli, near Nkoko (Dummer 3057, Dec. 1916) [previously recorded as *Ustilago Schweinfurthiana* Thüm.]; Kawanda (Hansford, Feb. 1940, U.2557).

SPHACELOTHECA SORGI (Link) Clinton in Journ. Mycol. viii, p. 140 (1902). On *Sorghum vulgare* Pers., Lwakaka, South Bugishu (J. D. Snowden, Nov. 1927, U.863).

TILLETIA AYRESII Berk. ex Massee in Kew Bull. 1899, p. 146. On *Panicum maximum* Nees, Victoria Nyanza region (T. D. Maitland, 1914); another specimen from the same source (from the Phanerogamic collection of the Kew Herbarium); Nabieso Lango (Hansford, Dec. 1926, U.810).

This smut is usually recorded as *Ustilago heterospora* P. Henn. (1897) or *Tilletia heterospora* (P. Henn.) Zundel (1938). The binomial *U. heterospora* was, however, first used by von Niessl in 1872 for a European smut on *Ornithogalum* and so, although von Niessl's name has since been accepted as a synonym of *U. Ornithogali* (Schmidt & Kunze) Magnus (1875), under Art. 61 of the International Rules *P. heterospora* P. Henn. is illegitimate. *Tilletia heterospora* therefore dates from 1938 and *T. Ayresii* is the valid name for this species.

The three collections are similar and agree with the type-specimens of *T. Ayresii* and of '*T. heterospora* P. Henn.', with both of which they have been compared.

Tilletia echinosperma Ainsworth, sp. nov. It was concluded from an examination of specimens of *Setaria sphacelata* (= *S. aurea*) and *S. longisetata* from Uganda and other parts of tropical Africa that a smut on these hosts which had been referred to '*Ustilago heterospora* P. Henn.' was distinct from *Tilletia Ayresii* on *Panicum* and the related smuts which have been recorded on *Setaria*. It is therefore described as new.

Sori ovaria destruentes, manifesti, 3–5 mm. longi ad 2–3 mm. lati, membrana robusta pallido-castanea apicem prope dehiscenti vestiti. *Massa sporarum* pallido-castanea semiagglutinata, sporis immaturis vel sterilibus et sporis fertilibus composita interque conidiophora bifurcata disposita. *Sporae steriles*, globosae, vel subglobosae aculeis obtusis dense ornatae, hyalinae, 12–28 μ diam. (saepè diversae; aliae 12–17 μ diam., aliae 22–28 μ diam.). *Sporae* globosae vel subglobosae, aculeis obtusis hyalinis vel pallido-tinctis 2–4 μ longis densissime ornatae, pallido-luteae vel olivaceae, 16–20 μ diam.

Hab. in ovariis *Setariae sphacelatae*; Kajomoro, West Nile, Uganda (A. S. Thomas, U.1995, typus).

Sori in the ovaries, conspicuous, 3–5 mm. in length and 2–3 mm. in breadth, limited by a tough light brown membrane of host tissue which splits at the apex to disclose a light brown, semi-agglutinated spore-mass composed of bifurcate conidio-phores, sterile or immature spores, and spores; sterile spores globose to subglobose, densely covered with blunt echinulations, hyaline, 12–28 μ in diam. (usually of two sizes 12–17 and 22–28 μ); spores globose to subglobose, densely covered with hyaline or slightly tinted blunt echinulations 2–4 μ long, pale golden-yellow to olivaceous-brown, 16–20 μ in diam.

On *Setaria sphacelata* Stapf & C. E. Hubb. (= *S. aurea*), Kajomoro, West Nile (A. S. Thomas, June 1936, U.1995, type; specimen in the Herbarium of the Imperial Mycological Institute); Nagunga (Dummer 3052, Dec. 1916) [previously recorded as '*Ustilago heterospora* P. Henn.']; Nabieso, Lango (Hansford, Dec. 1926, U.816); Sotik (J. McDonald, Feb. 1930, Herb. I.M.I.).

On *Setaria longisetata* Beauv. Kabale Kigezi (Hansford, July 1928, U.962; Aug. 1937, U.2217); Kinyala Masindi (Hansford, April 1930, U.1214).

Tilletia Ayresii was originally described on *Panicum maximum* and *T. echinosperma*, *Ustilago verrucosa* Wakef., and *U. Evansii* P. Henn. on *Setaria sphacelata* (= *S. aurea*). In the first three of these smuts and in *U. Evansii* as recently described by Zundel (Bothalia, III, p. 294; 1938) the spore mass is characterized by displaying two types of echinulate or verrucose spores, the one, apparently fertile, strongly pigmented and the other, immature or sterile, altogether hyaline and often of two sizes. The fertile spores of *T. echinosperma*, which when viewed in optical section show their fine closely set radiating echinulations forming a hyaline or slightly tinted halo around a pigmented disc, differ from those of the other three species. The spores of *T. Ayresii* (which has only been recorded on the type host) are smaller than those of *T. echinosperma* and verrucose, while those of *U. verrucosa* are larger and very coarsely verrucose. It has not been possible to examine the type of *U. Evansii*, but the spores of that species are '10–15 μ diam. . . dense verrucosis' (Hennings) ('14–21 μ . . . abundantly and coarsely echinulate' according to Zundel (loc. cit.)), and its difference from *T. echinosperma* is supported by the characters of two specimens (from Southern Rhodesia and South Africa) referred to *U. Evansii* which were available for examination.

TOLYPOSPORUM GLOBULIGERUM (Berk. & Broome) Ricker in Journ. Mycol. XI, p. iii (1905). On *Leersia hexandra* Sw., Kinyala, Masindi (Hansford, April 1930, U.1211) [previously recorded as *Testicularia Leersia* Cornu].

USTILAGO CYNODONTIS (P. Henn.) P. Henn. in Bull. Herb. Boiss. I, p. 114 (1893). On *Cynodon Dactylon* Pers., Kampala (Small 166, Jan. 1915).

USTILAGO KAMERUNENSIS Syd. in Engl. Bot. Jahrb. XLV, p. 262 (1910). On *Pennisetum purpureum* Schum., Mbarara (J. D. Snowden, 1930, U.1090).

USTILAGO PEGLERAE Bubák & Syd. in Ann. Mycol. Berl. XII, p. 264 (1914). On *Ornithogalum* sp., Kiwala Hill (Dummer 3926, Feb. 1918); Kampala (Hansford, Feb. 1930, U.1081).

USTILAGO RABENHORSTIANA Kühn in Hedwigia, xv, p. 4 (1876). On *Digitaria horizontalis* Willd., Kampala (Small 5, 1915) [previously recorded as *U. Digitaliae* (Kunze) Rabenh.]; Bukalasa (Hansford, Oct. 1930, U.1377) on *Digitaria* sp., Kabale Kigezi (Hansford, Aug. 1937, U.2218).

The first two specimens are typical of *U. Rabenhorstiana* as the spores are verruculose and measure 9–12 (av. 11.0) μ and 10–13 (av. 11.7) μ respectively. The spores of the third specimen (U.2218) are slightly smaller (8–10 (av. 8.6) μ), but otherwise indistinguishable from those of *U. Rabenhorstiana*, and are larger than the smooth spores of *U. Digitaliae*.

USTILAGO TRICHOPTERYGIS Mass. in Kew Bull., 1911, p. 224. On *Trichopteryx simplex* Benth., Lumbwa Kiagwe (Dummer 2815, June 1916).

This smut was listed by Hansford (E. Afric. Agric. Journ. III, p. 323, 1938) as '*Ustilaginoidea Trichopterygis* Wakefield'.

USTILAGO TRITICI (Pers.) Rostrup, Overs Danske Vid. Selsk. Forh. 1890, p. 15 (March 1890). On *Triticum vulgare* Vill., Walasi, Bugishu (J. D. Snowden, Nov. 1917, U.529).

USTILAGO UTRICULOSA (Nees) Tulasne in Ann. Sci. Nat. Ser. 3, VII, p. 102 (1847). On *Polygonum* sp., Kisoro, Kigezi (P. Chandler, Nov. 1938, U.2536).

The following two species have been reported from Uganda, but specimens have not been examined.

USTILAGO ISCHAEMI Fuckel, Enum. Fung. Nass. p. 22 (1861). 'On *Andropogon* sp., Stuhlmann, 1692, SW. of Lake Albert' (Verwoerd, Ann. Univ. Stellenbosch, Jaarg. IV, A II, p. 19 (1926)).

USTILAGO UGANDENSIS P. Hennings in Engl. Pflanzenw. Ost-Afrikas, v (c), p. 48 (1895). On *Panicum* sp., Kampala.

Excluded species.

TOLYPOSPORIUM PHILIPPINENSE Syd. in Ann. Mycol. Berl. x, p. 78 (1912). On *Hyparrhenia cymbaria* Stapf, Nagoge (Dummer 3011, Oct. 1916). This specimen, which was probably correctly determined, is a *Cerebella*.

THE FLORA OF THE DESERT TO THE SOUTH AND WEST OF BASRA, MESOPOTAMIA

By M. ZOHARY (Hebrew University, Jerusalem).

THE plants recorded in this paper were collected by A. Eig and the author in April 1933, on a geobotanical trip through the desert south and west of Basra.

As this area and the adjacent district, though explored by famous students of Arabia, had remained botanically a *terra incognita*, the first plant list of these parts has some importance for the florist and the plant geographer.

The area belongs to the Syrian Desert. This desert is bounded on the south by a line drawn from the Gulf of Aqaba and the Persian Gulf, which approximates to the thirtieth parallel of northern latitude. The eastern boundary is formed



by the Euphrates and the western by a line drawn from Aqaba through the Jordan Valley, the eastern slopes of the Antilebanon and the Homs-Aleppo road (see M. Zohary, 'Geobotanical Analysis of the Syrian Desert', Palestine Journ. Bot., Jerusalem Series, I, 1939).

An analysis of the flora of the area, based mostly upon our own observations, shows that the Syrian Desert is vegetationally very heterogeneous, being a meeting place of three well-defined phytogeographical regions:—(1) the Mediterranean, (2) the Irano-Turanian, (3) the Saharo-Sindian.

(1) The Mediterranean territory of the Syrian Desert is confined to the mountains of Transjordan bordering the Jordan Valley. It forms there a narrow strip between Petra and

Kuneitra broadening abruptly in Gilead and Golan, where it seems to be connected with Mediterranean territory of southern Syria. The isolated Jebel Druz also belongs to this territory. This territory benefits from a rather comparatively high rate of annual rainfall (500–250 mm.) and is characterized by forest and Maqui associations or by their degradation stages (A. Eig, 'On the phytogeographical subdivision of Palestine'. *Palestine Journ. Bot.*, Jerusalem Series, 1, p. 4, 1938).

(2) The Irano-Turanian territory extends over the whole northern part of the Syrian Desert. Its limit towards the south and west seems to be approximately a land strip passing from Ma'an through Ziza, Azraq, Rutba to Hit. Among the most characteristic plant communities of this territory mention may be made of (a) the *Pistacietum atlanticae*, confined chiefly to the hill chains of the Palmyrena and the northern plateau, (b) the *Artemisietum Herbae-albae*, which not only is characteristic of the vast plains of this territory, but always indicates true Irano-Turanian conditions, (c) the *Haloxylonetum articulatae*, etc.

(3) The Saharo-Sindian Territory occupies the remainder of the Syrian Desert. It represents the most desolate part of the Desert. It is characterized by a series of plant communities, as *Haloxylonetum salicornici*, *Haloxylonetum persici*, *Rhanterietum epapposi*, *Retametum Roetani* etc.

The area under review belongs to the Saharo-Sindian territory of the Syrian Desert. It was crossed by two routes with Basra as a starting point. One was in a south-westerly direction (northern Kuwait). The southernmost point reached was about 30 km. SW. of Zubair. The other route was towards the west, nearly parallel to the Basra-Ur railway-line, where the following localities were passed:—Kuweibda, At Tuba, An Nukhaila, Ar Rumail, Luqait, Jaliba, Tel Lahm, Ur. The area is a vast, somewhat undulating plain 0–70 m. above sea-level. The soil consists for the greater part of packed sand, generally covered with a thin layer of fine or rough gravel. This cover accounts for the fact that the soil retains some moisture and annuals may develop in abundance. Drifting sand rarely occurs, accumulating in small hillocks or at the foot of certain perennials.

We possess meteorological data only of Shuaiba, showing a mean annual precipitation of 139.4 mm. These data, however, do not characterize the entire area, as Shuaiba and its environs are favourably affected by the vicinity of the sea. As we proceed from Shuaiba westwards climatic conditions grow more severe. Proof of this is found in the vegetation and the fact that the western station, Diwaniyah, has an annual rainfall of only 67.3 mm., though situated much more to the north than Shuaiba.

The plant communities met with in this area are herbaceous. Except for single chamae- and hemi-cryptophytes, which often form leading plant communities, therophytes dominate. Among the 111 species met with in this area 76 are annuals.

One of the most important and characteristic perennials is *Haloxylon salicornicum* (Moq.) Bunge. This, a rather low herbaceous fleshy Chenopodiaceae, is scattered over hundreds of square miles, and is a leading plant of a most important plant-community. This community occurs in a few varieties according to external conditions, especially edaphic. *Haloxylonetum salicornici* reaches here its northern limit of distribution, and is replaced in the northern and central part of the Syrian Desert by *Haloxyletum articulati*. A large part of the plants enumerated here belong to the *Haloxylon*-community prevalent in the entire area between At Tuba and Ur Station, often interrupted by other less prominent plant communities.

Rhanterium epapposum may be mentioned among the other important perennials of this area. It is a low shrub, and a leading plant of the *Rhanterietum*, widely distributed on compact sandy soil. Musil, Laechnan, Philby and other students of Arabia report this plant from various localities of Northern Arabia, and we have collected it also in Wadi Sirhan. Probably this plant community is the most characteristic of Northern Arabia. *Rhanterium* is the known 'arfaj' of the Beduins of Northern Arabia, commonly used as fuel and camel food. In the vicinity of Basra we saw loads of it destined for the markets of Basra.

Other phyto-sociologically important plants are : *Astragalus spinosus*, *Andropogon laniger* (on somewhat loose sandy soil), *Convolvulus* ? *oxyphyllus*, *Heliotropium persicum*, *Lithospermum callosum*, *Teucrium Olivieri*, *Calligonum comosum* (on sand-hillocks), and *Ephedra alata*.

We noticed only a single shrub of *Zizyphus nummularia* which we met again in Wadi Muhammadi of the Syrian Desert. Another shrub is *Lycium barbarum*, which forms small dune embryos in the environs of Kuweibda and Rumail.

In the environs of Zubair *Tamarix articulata* is extensively cultivated. This tree needs irrigation in the first year, for which the well watered 'birs' of the vicinity are used. At 6-7 years the trees are cut for fuel and building purposes.

On the negative features of the district the following may be noted : *Artemisia Herba-alba*, which is very common in, and characteristic of, the Irano-Turanian territory of the Syrian Desert, is lacking here altogether. This in itself emphasizes the Saharo-Sindian nature of the area.

The following is a list of all the plants collected by Dr. Eig and myself in this area. The localities are generally indicated in the accompanying outline map. References such as 'Boiss. I, p. 118', are to Boissier's 'Flora Orientalis'.

PAPAVERACEAE.

ROEMERIA HYBRIDA (Linn.) DC.—Boiss. I, p. 118. Sulbie.

HYPECOUM PENDULUM Linn.—Boiss. I, p. 125. At Tuba ; between Ar Rumail and Luqait.

HYPECOUM GESLINII Coss & Krall. in Bull. Soc. Bot. Fr. IV, p. 522. Sulbie ; Ar Rumail.

CRUCIFERAE.

MATTHIOLA BICORNIS (Sibth. & Sm.) DC.—Boiss. I, p. 155. 29 km. SW. of Zubair ; Kuweibda ; At Tuba ; Ar Rumail ; Jaliba ; Ur. Very abundant over the entire area ; enters into most plant associations of this district. Further investigation will probably reveal that our material forms a separate species.

LEPTALUM FILIFOLIUM (Willd.) DC.—Boiss. I, p. 243. Sulbie ; At Tuba ; between Ar Rumail and Luqait.

TORULARIA TORULOSA (Desf.) Schulz in Engl. Pflanzenreich, Crucif.-Sisymb. p. 214. 26 km. SW. of Zubair ; At Tuba ; between Rumail and Luqait. Almost everywhere together with var. *scorpiuroides* (Boiss.) Schulz.

MALCOLMIA BUNGEI Boiss.—Boiss. I, p. 226. Between At Tuba and An Nukhaila ; Ar Rumail and westward. One of the most abundant and prettiest plants in this area.

ALYSSUM MENIOCIDES Boiss.—Boiss. I, p. 286. Between At Tuba and Ar Rumail.

DIPLOTAXIS HARRA (Forsk.) Boiss.—Boiss. I, p. 388. At Tuba ; between Ar Rumail and Luqait.

SINAPIS ARVENSIS Linn.—Boiss. I, p. 394. At Tuba. A single specimen, probably adventitious here.

SAVIGNIA PARVIFLORA (Del.) Webb.—Frag. Aeg. p. 47. At Tuba ; between Ar Rumail and Luqait ; Jaliba.

SCHIMPERA ARABICA Hochst. & St.—Boiss. I, p. 384. Zubair ; between At Tuba and An Nukhaila ; Ar Rumail ; Jaliba.

RESEDACEAE.

RESEDA DECURSIVA Forsk.—Fl. Aeg. arab. p. 67. 29 km. SW. of Zubair ; Luqait ; between At Tuba and An Nukhaila.

RESEDA ARABICA Boiss.—Boiss. I, p. 426. 26 km. SW. of Zubair ; At Tuba ; Kuweibda ; Ar Rumail.

OLIGOMERIS SUBULATA (Del.) Webb.—Boiss. I, p. 435. Sulbie ; At Tuba ; Kuwaibda ; between At Tuba and Ar Rumail ; Jaliba.

CAYLUSEA CANESCENS (Linn.) St. Hill.—Boiss. I, p. 436. Between At Tuba and An Nukhaila.

CISTACEAE.

HELIANTHEMUM LEDIFOLIUM (Linn.) Mill.—Gross. in Engl.

Pflanzenreich, Cistac. p. 101. 26 km. SW. of Zubair, At Tuba, between At Tuba and An Nukhaila.

HELIANTHEMUM SALICIFOLIUM (Linn.) Mill.—Gross. in op. cit. p. 104. Sulbie ; Kuweibda ; between At Tuba and Rumail, Luqait.

HELIANTHEMUM SESSILIFLORUM (Desf.) Pers.—Gross. in op. cit. p. 98. 20 and 29 km. SW. of Zubair ; Kuweibda ; At Tuba ; 10 km. W. of Rumail.

CARYOPHYLLACEAE.

VACCARIA SEGETALIS (Neck.) Garcke.—Asch. Fl. Prov. Brandenb. i, p. 84. At Tuba. Though growing within the *Andropogon* association, we are in doubt if it is primary there.

GYPHOPHILA ROKOJEKA Del.—Boiss. i, p. 543. At Tuba ; between At Tuba and An Nukhaila ; between Ar Rumail and Luqait.

SILENE LINEARIS Dene.—Boiss. i, p. 603. 29 km. SW. of Zubair ; At Tuba ; Kuweibda ; At Tuba and An Nukhaila.

SPERGULARIA DIANDRA (Guss.) Heldr. & Sart.—Boiss. i, p. 733. 20 and 25 km. SW. of Zubair ; Kuweibda ; between At Tuba and An Nukhaila ; Ar Rumail.

POLYCARPÆA REPENS (Forsk.) Asch. & Schw. in Oesterr. Bot. Zeitschr. xxxix, p. 126. 20 km. SW. of Zubair ; between Kuweibda and Ar Rumail.

POLYCARPON SUCCULENTUM (Del.) J. Gay.—Boiss. i, p. 736. Ar Rumail.

LOEFFLINGIA HISPANICA Linn.—Boiss. i, p. 738. Sulbie ; 25 km. SW. of Zubair ; At Tuba ; between Rumail and Luqait.

HERNIARIA CINEREA DC.—Boiss. i, p. 740. Zubair ; 29 km. SW. of Zubair ; between At Tuba and An Nukhaila ; Jaliba.

HERNIARIA HEMISTEMON J. Gay.—Boiss. i, p. 742. Kuweibda ; At Tuba.

PARONYCHIA ARABICA (Linn.) DC.—Boiss. i, p. 746. Sulbie ; 26 km. SW. of Zubair ; At Tuba ; Ar Rumail ; 9 km. E. of Luqait.

PARONYCHIA LENTICULATA (Forsk.) Asch. & Schw. in Oesterr. Bot. Zeitschr. xxxix, p. 128. Sulbie ; between At Tuba and Ar Rumail.

TAMARICACEAE.

TAMARIX ARTICULATA Vahl.—Boiss. i, p. 777. Cultivated in Kuweibda and between Kuweibda and At Tuba.

MALVACEAE.

MALVA PARVIFLORA Linn.—Boiss. i, p. 820. Between At Tuba and Ar Rumail.

ERODIUM PULVERULENTUM Willd. Sp. Pl. III, p. 632. Sulbie ; At Tuba, Rumail, Jaliba.

Erodium glaucophyllum Ait. var. *hirsutissimum* Zohary, var. nov. Folia utrinque adpresse hirsutissima ; caules adpresse hirsuti ; sepala majora ; tota dense hirsuta. 26 km. SW. of Zubair.

ZYGOPHYLLACEAE.

FAGONIA BRUGGIERI DC.—Boiss. I, p. 905. Zubair ; At Tuba ; between Ar Rumail and Luqait.

FAGONIA PARVIFLORA (Boiss.) var. *AUCHERI* Boiss.—Boiss. I, p. 908. Sulbie ; At Tuba ; Zubair.

RUTACEAE.

HAPLOPHYLLUM PROPINQUUM Spach.—Boiss. I, p. 940. 26 km. SW. of Zubair ; between At Tuba and Ar Rumail ; At Tuba.

RHAMNACEAE.

ZIZYPHUS NUMMULARIA (Burm.) Walk.—Boiss. II, p. 13. Between Ar Rumail and Luqait.

LEGUMINOSAE.

TRIGONELLA STELLATA Forsk.—Boiss. II, p. 85. 26 km. SW. of Zubair ; Kuweibda ; At Tuba ; between Ar Rumail and Luqait.

MEDICAGO LACINIATA All.—Boiss. II, p. 104. Zubair ; At Tuba ; An Nukhaila.

LOTUS VILLOSUS Forsk., Fl. Aeg. arab. p. 71. Sulbie ; At Tuba ; Ar Rumail.

HIPPOCREPIS BICONTORTA Loisl.—Boiss. II, p. 185. Zubair, Sulbie.

ASTRAGALUS TRIBULOIDES Del.—Boiss. II, p. 224. 6–29 km. SW. of Zubair ; Ar Rumail ; At Tuba ; Jaliba (incl. various varieties of this species).

ASTRAGALUS SCHIMPERI Boiss. SW. of Zubair ; between At Tuba and Rumail ; Jaliba.

ASTRAGALUS CORRUGATUS Bertol.—Boiss. II, p. 232. Between Ar Rumail and Luqait ; Jaliba ; At Tuba ; An Nukhaila.

ASTRAGALUS GYZENSIS Del.—Boiss. II, p. 234. Sulbie ; Ar Rumail ; Jaliba.

ASTRAGALUS ANNULARIS Forsk.—Boiss. II, p. 236. Sulbie ; 29 km. from Zubair ; At Tuba ; An Nukhaila ; Jaliba.

ASTRAGALUS SPINOSUS (Forsk.) Muschl.—Beitr. z. Kenntn. d. Flora v. El Tor, p. 98 (1907). SW. of Zubair ; At Tuba Ar Rumail.

ROSACEAE.

NEURADA PROCUMBENS Linn.—Boiss. II, p. 735. Sulbie ; 26 km. SW. of Zubair ; At Tuba ; Jaliba.

CUCURBITACEAE.

CITRULLUS COLOCYNTHIS (Linn.)—Boiss. II, p. 759. Jaliba.

AIZOACEAE.

AIZOON HISPANICUM Linn.—Boiss. II, p. 765. Basra ; Zubair ; Kuweibda ; between At Tuba and Ar Rumail ; Jaliba.

UMBELLIFERAE.

BUPLEURUM GLAUCUM Rob. & Kast.—DC. Prodr. IV, p. 127 (1830). Kuweibda.

ANISOSCIADIUM ORIENTALE DC.—Boiss. II, p. 950. Zubair.

DIPSACEAE.

Scabiosa Olivieri Coult. var. *deserti* Zohary, var. nov. Setae calycinae breviores, caules et rami patule setosi. 10 and 29 km. SW. of Zubair ; At Tuba, between At Tuba and An Nukhaila.

COMPOSITAE.

ASTERISCUS PYGMAEUS Coss. & Dur.—Boiss. III, p. 179. Zubair ; 29 km. SW. of Zubair ; At Tuba.

RHANTERIUM EPAPPOSUM Oliv.—Hook. Ic. Pl. t. 1367. 29 km. SW. of Zubair, between Basra and At Tuba. Also observed in Wadi Sirhan (near Azrak). Cheesman reports this plant from Hasa and Jabrin. It is one of the most important plants of N. Arabia both phyto-sociologically and economically, being used as a fuel plant of the woodless desert. It would doubtless be much more common in the area visited, were it less exploited. At Tuba seems to be its northernmost station.

IFLOGA SPICATA (Forsk.) Sch.-Bip.—Boiss. III, p. 240. 29 km. SW. of Zubair ; Kuweibda ; At Tuba ; between At Tuba and Ar Rumail.

ANTHEMIS MELAMPODINA Del.—Boiss. III, p. 309. 25 km. SW. of Zubair ; Kuweibda ; Ar Rumail.

CHAMAEMELUM AURICULATUM Boiss.—Boiss. III, p. 327. Between At Tuba and An Nukhaila.

ARTEMISIA SCOPARIA Walldt. & Kit.—Boiss. III, p. 364. At Tuba.

LASIOPOGON MUSCOIDES (Desf.) DC.—Boiss. III, p. 224. Between At Tuba and An Nukhaila.

GYMNARRHENA MICRANTHA Desf.—Boiss. III, p. 240. Zubair ; Sulbie ; 26 km. SW. of Zubair ; Kuweibda ; At Tuba ; An Nukhaila, Luqait ; Jaliba ; Ur. One of the commonest plants of these places.

FILAGO PROSTRATA (Parl.) Boiss.—Boiss. III, p. 246 (sub var.). Sulbie ; 29 km. SW. of Zubair ; At Tuba ; between At Tuba and Ar Rumail ; between Ar Rumail and Luqait. Owing to some constant morphological characteristics and to its ecological and phytogeographical behaviour this form must be separated as a species from *F. spathulata*, which is a segetal plant.

SENECIO CORONOPIFOLIUS Desf.—Boiss. III, p. 390. Between Basra and Kuweibda ; between At Tuba and Nukhaila ; Luqait.

KOELPINIA LINEARIS Pall.—Boiss. III, p. 721. Sulbie ; between Ar Rumail and Luqait.

LEONTODON HISPIDULUS (Del.) Boiss.—Boiss. III, p. 727. Sulbie ; Kuweibda ; Rumail ; Jaliba.

PICRIS BABYLONICA Hand.-Mazz. in Ann. naturhist. Hofmus. Wien, XXVII, p. 453 (1913). 25 km. SW. of Zubair ; Kuweibda ; between At Tuba and An Nukhaila ; Ar Rumail ; Jaliba (everywhere together with var. *dimorphocarpa* Eig in Palestine Journ. Bot., Jerusalem Ser. I, p. 75 ; 1938).

LAUNEA NUDICAULIS (Linn.) Hook. fil., Fl. Brit. Ind. III, p. 416 (1882). Zubair ; Kuweibda ; between Ar Rumail and Luqait.

LAUNEA GLOMERATA (Linn.) Hook. fil. Fl. Brit. Ind. III, p. 3, 415 (1882). Ar Rumail.

REICHARDIA TINGITANA (Linn.) Roth, Bot. Abh. p. 35 (1787). 26 km. SW. of Zubair.

PRIMULACEAE.

ANAGALLIS CAERULEA (Gouan) Schreb. Fl. Lips. p. 5 (1771). Between At Tuba and An Nukhaila.

CONVOLVULACEAE.

CONVOLVULUS ? *OXYPHYLLUS* Boiss. Pall.—Boiss. IV, p. 88. 26 km. SW. of Zubair. Our specimens are in a very young state so that we are not sure if they really belong to this species.

BORAGINACEAE.

HELIOTROPIMUM PERSICUM Lam.—Boiss. IV, p. 147. At Tuba ; between At Tuba and Nukhaila ; between Rumail and Luqait. A very abundant plant, which flowers already in its first year.

GASTROCOTYLE HISPIDA (Forsk.) Bunge, Rel. Lehm. p. 405 (229) (1847). At Tuba ; An Nukhaila ; 26 km. SW. of Zubair ; Jaliba.

ARNEBIA DECUMBENS (Vent.) Coss. & Kral. in Bull. Soc. Bot. Fr. iv, p. 402 (1857). At Tuba ; Kuweibda (together with var. *macrocalyx* Coss. & Kral.).

ARNEBIA LINEARIFOLIA DC.—Boiss. iv, p. 214. Zubair ; Sulbie ; 26 km. SW. of Zubair ; At Tuba ; An Nukhaila ; Jaliba (always on loose sandy soil). Among the material of these localities two forms were observed : one with long calyces and smooth nutlets, the other with somewhat shorter calyces and strongly tubercled nutlets.

ARNEBIA TINCTORIA Forsk.—Boiss. iv, p. 215. 29 km. SW. of Zubair ; At Tuba ; An Nukhaila ; Jaliba.

LITHOSPERMUM CALLOSUM Vahl.—Boiss. iv, p. 219. Sulbie ; 29 km. SW. of Zubair.

LAPPULA SPINOCARPOS (Forsk.) Asch. in Sitzungsber. Bot. Ver. Brand. xvi, p. 88 (1874). Between Ar Rumail and Luqait ; At Tuba ; Ar Rumail ; Jaliba.

Lappula spinocarpos (Forsk.) Asch. var. *inermis* Zohary, var. nov. Fructus laevis ; calyx deciduus. Jaliba.

SOLANACEAE.

LYCIUM BARBARUM Linn.—Boiss. iv, p. 289. Jaliba.

SCROPHULARIACEAE.

LINARIA HAELEVA Forsk.—Boiss. iv, p. 381. Sulbie ; At Tuba ; Ar Rumail.

LINARIA ALBIFRONS (Sibth. & Sm.) Spreng.—Boiss. iv, p. 382. Kuweibda ; At Tuba.

SCROPHULARIA DESERTI Del.—Boiss. iv, p. 414. 29 km. SW. of Zubair ; Kuweibda ; between At Tuba and An Nukhaila.

PLANTAGINACEAE.

Plantago ovata Forsk. var. *decumbens* (Forsk.) Zohary. Forsk. Fl. Aeg. arab. p. 30 (1775 sub *P. decumbens*). Between Ar Rumail and Luqait.

PLANTAGO CILIATA Desf.—Boiss. iv, p. 387. Between Kuweibda and Rumail.

OROBANCHACEAE.

CISTANCHE TUBULOSA (Schenk) Wight, Ic. t. 1420 bis (1841-50). Ar Rumail (on *Haloxylon salicornicum*).

LABIATAE.

SALVIA AEGYPTIACA Linn.—Boiss. iv, p. 631. Between At Tuba and Ar Rumail.

TEUCRIUM OLIVIERANUM Ging.—Boiss. iv, p. 810. Between Ar Rumail and Luqait.

TEUCRIUM POLIUM Linn.—Boiss. iv, p. 821. At Tuba ; An Nukhaila.

CHENOPODIACEAE.

CHENOPODIUM MURALE Linn.—Boiss. iv, p. 902. Kuweibda.

HALOCNEMUM STROBILACEUM (Pall.) M.-B.—Boiss. iv, p. 936. Basra ; Zubair ; 25 km. SW. of Zubair.

HALOXYLON SALICORNICUM (Moq.) Bunge.—Boiss. iv, p. 949. 6 km. E. of At Tuba ; between At Tuba and An Nukhaila ; Jaliba ; 10 km. E. of Luqait.

ANABASIS SETIFERA Moq.—Boiss. iv, p. 970. Between Ar Rumail and Luqait ; Jaliba.

POLYGONACEAE.

EMEX SPINOSUS (Linn.) Campd.—Boiss. iv, p. 1005. 29 km. SW. of Zubair ; Kuweibda ; Rumail ; At Tuba ; Jaliba. A rather common plant in somewhat sandy soils.

CALLIGONUM COMOSUM L'Hér.—Boiss. iv, p. 1000. Ar Rumail.

CYNOMORIACEAE.

CYNOMORIUM COCCINEUM (Linn.)—Boiss. iv, p. 1072. Ar Rumail (on *Haloxylon salicornicum*).

EUPHORBIACEAE.

EUPHORBIA ISTHMIA v. Taekholm. Svensk Bot. Tidskr. xxvi, 1-2 (1932). Luqait.

EUPHORBIA Densa Schr.—Boiss. iv, p. 1091. 25 km. SW. of Zubair ; Kuweibda ; At Tuba ; between At Tuba and An Nukhaila ; between Ar Rumail and Luqait ; Jaliba. Very abundant ; a characteristic plant of the *Haloxylon* association.

LILIACEAE.

GAGEA TENUIFOLIA (Boiss.) Fomin in Flora U.S.S.R. iv, p. 101 (1935). Between Kuweibda and Ar Rumail ; Jaliba ; Sulbie.

ASPHODELUS VISCIDULUS Boiss.—Boiss. v, p. 315. 29 km. SW. of Zubair ; At Tuba ; between Ar Rumail and Luqait ; Jaliba.

ASPHODELUS TENUIFOLIUS Cav.—Boiss. v, p. 314.

CYPERACEAE.

CAREX PACHYSTYLIS Gay in Ann. Sc. Nat. ser. 2, x, p. 301 (1838). Between Basra and Jaliba.

GRAMINEAE.

ANDROPOGON LANIGER Desf.—Boiss. v, p. 465. 20 km. SW. of Zubair ; At Tuba.

ARISTIDA PLUMOSA Linn.—Boiss. v, p. 495. 6–29 km. SW. of Zubair.

STIPA TORTILIS Desf.—Boiss. v, p. 500. 26 km. SW. of Zubair ; Kuweibda ; Jaliba ; between Ar Rumail and Luqait. Very abundant, chiefly in association with *Haloxylon salicornicum*.

CYNODON DACTYLON (Linn.) Pers.—Boiss. v, p. 553. Between Kuweibda and Ar Rumail.

KOELERIA PHLEOIDES Pers.—Boiss. v, p. 572.—Between At Tuba and An Nukhaila ; Kuweibda ; 20–29 km. SW. of Zubair.

SCHISMUS CALYCINUS (Loefl.) Coss.—Coss. & Dur. Expl. scient. Alger. II (1854–1867). Ar Rumail ; between Kuweibda and Ar Rumail ; between At Tuba and An Nukhaila.

SCLEROPOA MEMPHITICA (Spreng.) Parl. var. DICHOTOMA (Parl.) Bon. & Bar.—Cat. Pl. Tunis, p. 483 (1896). Between Kuweibda and Ar Rumail.

GNETACEAE.

EPHEDRA ALATA Dec.—Boiss. v, p. 804. Luqait. Observed also at Deir Ez Zor (Syrian Desert).

PRIMULA OBTUSIFOLIA ROYLE.

By Sir WILLIAM WRIGHT SMITH.

THIS is one of the most elusive members of the genus *Primula*, and its story is well worth giving in some detail. It was discovered well over a hundred years ago in the North-western Himalaya in an area which, even at that time, was not very remote. The chances were that it would easily be found again, but in actual result very few collectors subsequently obtained it, and in practically all cases what they found was not referred to *P. obtusifolia*.

The first discoverer was Dr. Royle, at one time Superintendent of the Botanic Garden at Saharanpur, and a member of the medical staff of the Bengal army. He found it in Kunawar in 1831, and when he published in 1839 his 'Illustrations of the Botany of the Himalayan Mountains' he accorded it a brief description and an excellent plate (t. 77, f. 1). Here is his statement :—'*P. obtusifolia* ; foliis obovatis obtusis basi attenuatis membranaceis subtus farinosis, margine subcrenato undulato, petiolis latis membranaceis, umbella



erecta pauciflora, corolla sub-hypocrateriformi. Hab. Lippa, in Kunawar. I am indebted to my friend, W. Wilson Saunders, Esq., for the drawing of this plant.'

Herbarium specimens of the true plant have always been very rare, and there has been considerable doubt as to what represented Royle's type. By great good fortune I have recently had the opportunity of examining the complete collection of *Primula* material in the herbarium of the Forest Research Institute, Dehra Dun. This herbarium is very rich in material of *Primula* from the North-western Himalaya. I believe that the old Saharanpur herbarium was transferred to Dehra Dun when the former place was given up as a botanical centre. In the material which I have examined is a sheet of *P. obtusifolia* collected in 1831, and bearing the locality 'Lippu, Kunour'. There is but one specimen of the plant on the sheet, but a careful comparison of this with Royle's plate makes it perfectly clear that it was from this individual plant that the drawing was made. The height, the number of leaves, the position of the withered leaves, the number of flowers and the stage of development of the flower are all in keeping with this view. I am also able to conclude that the drawing made by Mr. Saunders was constructed from this individual plant before it was pressed, dried and mounted. There is in no herbarium any evidence of other material of this first collecting. In the herbaria of Calcutta and Edinburgh there are two sheets—one in each place—dated 1831, but without collector's name. These two sheets are all from the one gathering, as can be judged by the state of the leaves and by the condition of the flowers, but they do not correspond in these respects to Royle's original, although they correctly represent the true species. I shall refer to these two sheets again. The oldest specimen of the species at Kew appears to be one from the Hooker Herbarium, with an indication that it came from Herb. Royle. It is without locality, collector's name or date, but may well have been collected in 1831 either by Royle or by one of his men. There is also at Kew another early sheet, no. 2879, from Herb. Munroanum, dated June 1844, from Roopen (the Rupin Pass, where Drummond secured it much later). As far as I can judge from herbarium records, it was a long time before the plant was seen again, although the North-western Himalaya received more attention than any other part of the range until Hooker's explorations in Sikkim.

The next specimen to come to light was a scrap in advanced fruit collected in September 1864 at Harang, North-western Himalaya, at 12,000 ft., by Dr. (afterwards Sir Dietrich) Brandis. This unidentified sheet in the Calcutta herbarium was recognized by Sir Isaac Bayley Balfour as a fruiting

specimen of the true species, and in a note on the sheet he remarks that it was the only fruiting specimen he had seen. This scrap had remained unidentified for fifty years.

The next evidence I have found is a sheet under *Primula* sp. in the Edinburgh herbarium, collected by Mr. J. R. Drummond in August 1885, under no. 25279. Duplicates of this sheet are in the herbarium at Kew. It was obtained on the Rupin Pass, Kunawar, and it was this precise indication of locality which has made it possible in 1939 to secure ample material of this rare species.

The Dehra Dun herbarium supplies me with two additional records. In September 1891, Mr. J. H. Lace collected it under no. 336 at 14,300 ft. on the Kiári Pass, Bashahr. It is inscribed in his handwriting '*P. purpurea*', but without giving an authority, as if he were just somewhat uncertain. The second Dehra Dun record is a specimen collected by Mrs. Minniken in Kulu, received in Dehra Dun in June 1924, and given the number 38400. Accompanying it is a ticket, identifying it as *P. purpurea* Royle. No further authentic material seems to have come to light until the rediscovery of the plant in 1939.

In the meantime, much confusion was caused by the identification of quite a number of other species as representing Royle's plant. The first reference to the species after Royle is by Duby (in DC. Prodr. viii, p. 42; 1844), but nothing of any consequence is added to Royle's record. The amplified description is evidently based on Royle's figure, and not either on his original or on additional material. The next reference is by Klatt in 'Journal of Botany' vi,*p. 121 (1868). There, under *P. obtusifolia* Royle, are quoted four numbers of Schlagintweit, collected in 1855-6, partly in Tibet and partly in Kumaon and Kulu. I have not seen all these specimens, but Pax, in his 'Monograph' (1905), refers one of these numbers (9646) to *P. Moorcroftiana*, and quotes only one other number (5698), which he refers with doubt to *P. obtusifolia*. I have examined a duplicate of this number in the British Museum, and it represents nothing more than a form of *P. macrophylla*. In the same herbarium is no. 12107, and that is *P. Moorcroftiana*. It is unlikely that the remaining number, 12102, is anything else than one or other of these species, and it is fair to conclude that Schlagintweit did not collect *P. obtusifolia*. It may be mentioned here that the earlier note by Pax (in Engl. Bot. Jahrb. x, p. 213, 1889), is merely a citation of previous references, while the distribution given is Eastern Himalaya, which is an error. He takes the opportunity to separate off Hooker's variety *Griffithii* as a species, but ascribes it incorrectly to the Western Himalaya. This variety is usually attributed to Watt, but, as a matter of fact, Watt, in his 153 SESS. (1940-I).

original paper, had described it as a species under another name, while Hooker, in his revision of Watt's paper, regarded it as of varietal rank only.

The next step was taken in 1881, when Sir George Watt communicated a paper on the Indian species of *Primula* to the Linnean Society (Journ. Linn. Soc. Lond., Bot. xx, p. 7; 1884). It so happened that Sir Joseph Hooker had reached Primulaceae in the preparation of the third volume of the 'Flora of British India', and the material and new species submitted by Watt were utilized by him in his account of Primulaceae in that volume. See preliminary note by Hooker at beginning of Watt's paper as published, loc. cit. The third volume of the 'Flora of British India' (including Primulaceae) was published in 1882, but Watt's paper in a much abridged form did not appear until 1884. Watt's original paper was of the nature of a treatise on the Indian species of *Primula*, and was put by the Linnean Society into page-proof in 1881, but subsequently withdrawn. I have Watt's own copy of this proof, with many notes and emendations by both Hooker and Watt. This is germane to the story of *P. obtusifolia*, because at this juncture a wrong turning was taken which confused the issue for the next thirty years. The North-western Himalayan plant was taken to be the same as a common Sikkim plant, now known as *P. Roylei*. The error was, no doubt, due to the paucity of the original material collected in 1831, and especially to the fact that it showed flowers only, and not the characteristic fruit. Watt's own views were never quite consistent. In his extensive unpublished paper he unites Royle's plant with the globose-fruited Sikkim species. In the published paper, edited and altered by Hooker, the same opinion was upheld, and had also appeared in Hooker's own exposition in the 'Flora of British India' two years before. Both had collected the Sikkim plant, Hooker during his classic exploration, but Watt not till May 1881; Watt (as will be related later) once found Royle's plant in strange guise, but his specimens were not recognized as such until long after his death. I must now refer to the two sheets previously mentioned—one in Herb. Calcutta, and one in Herb. Edinburgh. The latter (ex Herb. Watt), has attached to it the following note which formed part of the original MS. of his paper—according to Watt:—

'*P. obtusifolia* Royle:—leaves thin, delicate green, ovate-oblong, obtuse, tapering into petiole sheathing at the base, minutely serrulate, scape with 2-4 flowers, pale lilac with yellow throat upon long thin pedicels, bracts awl-shaped, small.

'North West Himalaya, Kumaon.

'Leaves forming a sheathing mass around the short erect stem, 4-6 inches long by 1 broad. Flowers large, pale lilac.

Calyx less than $\frac{1}{4}$ inch, more than $\frac{1}{2}$ cut into fine linear acuminate teeth. Corolla tube twice the length of calyx, limb flat of five short rounded lobes only slightly emarginate. Stamens large.

‘There are two specimens of this plant in the Royal Botanic Gardens Herbarium, Calcutta (evidently Royle’s plant) from the Herb. of General * collected at Kumaon. These are very likely to have been seen by Royle and compared with his type if not indeed collected by him. One of these has been at my suggestion sent by Dr. King to Kew Herbarium.’

At the bottom of the sheet is a further note by Watt :— ‘This is probably the true plant so named by Royle, and as the species is all but lost in herbaria this might be regarded as a type sheet.’

I have seen the portion belonging to Calcutta, and there the date is definitely 1831, but I read the locality as ‘Kunour’, and not as ‘Kumaon’, which I think must have been a mistake of Watt in transcription. The sheet thus annotated by Watt on his return to India (1881) was apparently never sent to Kew, but found its way into Watt’s own herbarium. The information, however, was evidently communicated to Hooker before publication of vol. III of the ‘Flora of British India’ (1882), p. 489, where Kumaon is cited, on the basis of this record. Watt’s new viewpoint was the correct one, but there is no evidence that it was ever brought to Hooker’s notice. On the contrary, when Watt’s abridged paper was published in 1884, the description accorded to *P. obtusifolia* is based chiefly on the Sikkim plant, and the figure (tab. V) is not *P. obtusifolia*—it is *P. Roylei*.

Watt’s true interpretation was thus overlooked for the next thirty years, and strangely enough, was departed from by Watt himself! After his retirement from India (where he carried out still further explorations in the Himalaya subsequent to his 1881 paper) he contributed to the Royal Horticultural Society a long paper entitled ‘Observations on Indian Primulas’ (Journ. Roy. Hort. Soc. xxix, p. 295; 1904). In this paper he refers again (loc. cit. p. 316) to *P. obtusifolia*, and I think I should begin by quoting his statement :—

‘Of *P. obtusifolia* the Professor writes that it is a fine hardy species, but not very free; perhaps we have not given it much attention. This occurs in India on grassy hillsides, and where met with is exceedingly plentiful. In Sikkim I found miles of country literally covered with it, and its strong metallic smell was so overpowering that I and most of my party got severe headaches. A little higher we came on a yellow-flowered form of the same plant that had a delicate perfume.

* Name blank in Watt MSS.

'*P. elongata* was originally collected by Sir J. D. Hooker. It has since been gathered by Jaffrey, Pantling, and others, at altitudes of 11-13,000 feet. Sufficient material has thus come to light to justify its separation from *P. obtusifolia*. It flowers in June and has the leaves of *sikkimensis*, but with greatly elongated corolla tubes. The flowers are very delicate, the petals thin, glabrous, and veined.

'A plant that I take to be possibly a form of *P. elongata* was found by me in Sikkim. It has large pendulous flesh-coloured flowers, the petals being thick and woolly in texture. It has the most delicate perfume of any plant I ever came across. It is not as yet named, is but imperfectly represented in herbaria, and may prove a good new species.'

From the above it is clear that Watt was now disposed to accept the published view as to the conspecificity of the Western and Eastern plants, for there is no doubt that the plant he refers to in the first paragraph is *P. Roylei*. What he meant by the yellow-flowered form of the same plant I cannot quite determine, unless it is to be referred to *P. elongata* in the second paragraph, where he points out that the additional material of *P. elongata* is sufficient to justify separation from *P. obtusifolia*, and *P. elongata* has a definitely yellow flower. I have no doubt that the plant referred to in the third paragraph is *P. obliqua* W. W. Sm., and Watt's specimen in his own herbarium assures this view.

It is clear that at the beginning Hooker and Watt were in agreement, and Hooker, in his exposition of Primulaceae in the 'Flora of British India' (1882), based most of his description of *P. obtusifolia* on plants from the Eastern Himalaya. The capsule was globose, and sunk in the calyx. This interpretation of *P. obtusifolia* is repeated shortly afterwards in the 'Botanical Magazine' (t. 6956; 1887). The plant there illustrated under *P. obtusifolia* is one secured from the Eastern Himalaya, and is either a variation of *P. Griffithii* Pax or, as is more likely, one of the more distinctly petiolate forms of *P. Roylei*. In his account of the plant under this 'Botanical Magazine' figure Hooker mentions another variety collected by Watt in Sikkim which has yellow flowers. In all probability this plant of Watt is *P. obliqua* W. W. Sm. There may be some degree of resemblance in the dried state, but the living plant in flower and in fruit is far removed. Hooker at the same time makes reference to Royle's figure which does not fit in well with the 'Botanical Magazine' plate, and the implication is that in Royle's figure the corolla tube is much too long and narrow and the colour is lilac. Royle's figure, however, is quite correct. Hooker mentions the plant as being abundant in Sikkim. This is quite true, but the plant which is so abundant in Sikkim as to induce this comment is *P. Roylei*.

Seeds of this Sikkim plant have been sent many times to this country, but success in germination is rare, and apparently there were better plants of it in this country in 1886-7 than there are now.

Hooker's authority and verdict were sufficient to settle the problem for many years and the name *P. obtusifolia* was attributed nearly always to the Sikkim plant (*P. Roylei*), as the North-western Himalayan plant did not again come within the botanist's ken for a very long time.

The next reference is in Pax's Monograph of Primulaceae (Engl. Pflanzenr. p. 118; 1905). It does not appear that Pax saw any genuine material of *P. obtusifolia*, although he refers with doubt to one collection of Schlagintweit from the Tibetan province of Balti. *P. Griffithii*, already removed from *P. obtusifolia* by Pax, is now given a diagnosis and correctly attributed to the Eastern Himalaya.

At the Primula Conference in April 1913 (Journ. Roy. Hort. Soc. XXXIX, p. 196) Watt's paper of 1904, already referred to, was repeated without alteration, and is mentioned again here as evidence that Watt had seen no reason to change his view nor to refer to his isolated and correct interpretation. At that conference Sir Isaac Bayley Balfour had devoted his attention chiefly to the species of *Primula* found within the confines of China, but shortly afterwards he began a study of the Himalayan species, and in 'Notes from the Royal Botanic Garden, Edinburgh', vol. IX (1916), pp. 168, 198, are given descriptions of *P. Roylei* and of *P. Gammieana*. Attached to his description of *P. Roylei* (loc. cit. p. 200) a clear statement is given of the proper position of *P. obtusifolia* Royle. There Balfour clearly states that it does not occur in Sikkim and is a very different plant from all Sikkim species. He mentions some nine different plants which have all been confused at one time or another with *P. obtusifolia*. The material available for Balfour at this time was still extremely meagre, and it was possibly the fruiting specimen collected by Brandis which confirmed him in the view that Royle's plant was quite distinct from the numerous species with which confusion had arisen. The problem still remained why *P. obtusifolia* should be so rare in herbaria, should never have been in cultivation, and scarcely ever reported since the days of Royle, or certainly not after the middle of the nineteenth century. It is certainly strange that a plant found in a reasonably well-known area in the Himalaya should have almost disappeared since 1831, or a few years later. It seemed as if there was nothing to go on except the collections of 1831, and the doubtful specimens of Schlagintweit. I have long been interested in the Himalayan species although I have had no opportunity of extensive travel in the north-western portion of that range, and I have frequently called the attention of friends in that region

to the possibility of the rediscovery of Royle's plant. Quite a number of botanists and travellers did their best, but the plant remained remarkably elusive until 1939. In the North-western Himalaya *P. macrophylla* D. Don is found profusely, and varies a good deal in size, character of leaf and in the number and colour of the flowers. Now and again one was almost persuaded that certain of these forms of *P. macrophylla* represented Royle's original, but there was always a doubt, and none of the material received from the North-western Himalaya during the last ten to fifteen years was quite convincingly the desired plant. In the event none of them were. It was here that the unnamed specimen of Drummond (no. 25279) came to my attention, and it indicated that Royle's plant was still there for the finding. By great good fortune Captain Sherriff and Mr. Ludlow, who had previously been in the North-western Himalaya, and who had just returned from a most profitable exploration of that part of south-east Tibet bordering on Bhutan, agreed to continue the search. Captain Sherriff had with him a skilled Lepcha collector named Tsongpen, and in the summer and autumn of 1939 this collector was given the chance to explore carefully the likely areas as far as they could be judged from the few herbarium specimens available. A photograph of Royle's plate was sent out as a guide, and Captain Sherriff gave him the wise advice to collect and dry ample material of every *Primula* he saw. Tsongpen was completely successful, and in addition secured seed. The seed has been distributed to quite a number of centres in Great Britain, and we may anticipate that some one will be able to produce living plants of it at an early date. If one is to judge from its nearest allies, germination should be reasonably good.

Tsongpen made six separate collectings, and it seems well worth while to state these in full :—

'Kamru, Baspa Valley, Simla Hill States, Punjab. Lat. 31° 26'. Long. 78° 15'. Alt. 13,500 ft. Flowers bluish purple, yellow eye, tube blue inside. Back of leaves with white farina. On open hillside among large rocks. 26. 6. 39.' G. Sherriff, no. 7344.

'Haran Pass, Baspa Valley, Simla Hill States, Punjab. Lat. 31° 27'. Long. 78° 15'. Alt. 13,000 ft. Flowers bluish purple, with yellow eye. Outside of corolla blue. Back of leaves with sticky white farina. On open rocky dry slopes. 2. 7. 39.' G. Sherriff, no. 7388.

'Rupin Pass, Dhaola Dhar Range, Simla Hill States, Punjab. Lat. 31° 22'. Long. 78° 09'. Alt. 14,500 ft. Flowers purple, white eye. Dry situation on open boulder scree. Back of leaves covered with white farina. 7. 7. 39.' G. Sherriff, no. 7408.

'Chitkal, Baspa Valley, Simla Hill States, Punjab. Lat.

31° 22'. Long. 78° 25'. Alt. 12,500 ft. From 1 to 1½ ft. high. Flowers purple, eye white. Back of leaves white farinose. On open dry boulder scree. 16. 7. 39.' G. Sherriff, no. 7466.

Charang Pass, Baspa Valley, Simla Hill States, Punjab. Lat. 31° 23'. Long. 78° 28'. Alt. 14,000 ft. Up to 1 ft. Flowers purple, eye white. Back of leaves white farinose. On dry open boulder scree. 22. 7. 39.' G. Sherriff, no. 7473.

Kamru, Baspa Valley, Simla Hill States, Punjab. Lat. 31° 26'. Long. 78° 15'. Alt. 13,000 ft. Up to 1½ ft. Taken from same place as No. 7344. Flowers over. Back of leaves white farinose. On open hillside among large rocks. 30. 7. 39.' G. Sherriff, no. 7491.

Some of the specimens are convincing equivalents of Royle's original type, and a clear indication that his figure was quite correct. At the same time, there is a rather interesting sequel. In addition to smaller specimens corresponding to Royle's original, Tsongpen also collected in the same place large editions of the plant, some of them quite a foot high and more. There is no doubt but that both large and small specimens belong to the same species, and the discovery of this range in size has solved another North-western Himalayan problem as regards the plant known as *P. Traillii*. In October 1894 Sir George Watt, while exploring in the neighbourhood of the Sharran Glaciers, in Kulu, North-western Himalaya, found a tall Primula in fruit, which he recognized as distinct from anything which he had previously seen in any part of the range. No flowers were available except a few very withered remains. Watt, therefore, did not venture to give a description of his species, but the plant is referred to in his 1904 paper (p. 212), and there he intimates that he was proposing to name it in honour of the Rev. J. Traill of Jaipur. He mentions also that he thought he had secured good seed of the plant, but when this was subsequently grown in England it turned out to be *P. involucrata*. There must have been some mistake either by collector or cultivator. However, in 1915, during his studies of the Himalayan Primulas, Sir Isaac Bayley Balfour took up the MS. name and gave a description (Notes Roy. Bot. Gard. Edinb. ix, pp. 49, 50; 1915). Watt himself was inclined to place the plant near *P. sikkimensis*, but Balfour did not quite agree with this, although at the time he did not indicate what he considered was its correct affinity.

The attention of collectors in the North-western Himalaya during the last ten years has been directed also towards the discovery of better material of *P. Traillii*, but without any success. In so far as herbarium material is concerned, there is in Edinburgh a sheet obtained by Inayat, Duthie's very able collector, in July 1899 at Bibyali, Nila, Kagan, in the district of Hazara. It is without number and without name, but it

is Watt's plant. A fragment was also collected in Kulu in the neighbourhood of the Sharran Glaciers in October 1916, by R. E. Cooper. This has only the rootstock and some withered leaves, but is the plant seen by Watt. But the ample range of material collected by Tsongpen (Sherriff, no. 7344) makes the position quite clear. *P. obtusifolia* varies much in size. Smaller plants agree completely with Royle's type. Larger plants are undoubtedly Watt's *P. Traillii*.

The paucity of material of the true plant and the strong superficial similarity between this species and what is now known as *P. Roylei* go a long way to explain the confusion which has existed for so long concerning these Himalayan species. Had fruiting material been available it is unlikely that any difficulty would have arisen. The Sikkim plant, *P. Roylei*, which for so long usurped the place of *P. obtusifolia*, has a round capsule producing a fruit characteristic of the Petiolares Section. It does not open by teeth, but crumbles to let the seed loose. On the other hand, the capsule of *P. obtusifolia* is not round, but oblong, more or less equalling the calyx at dehiscence, and equipped with a set of triangular teeth. Its capsule is not unlike that found in the Section Nivales, with members of which it has also been confused. In arranging his Himalayan material in the herbarium, Balfour placed the plant in association with *P. Jaffreyana* and *P. Caveana* in the Section Obtusifolia, and *P. Traillii* was put in the same section. This small section has undoubtedly its closest affinity with the Section Nivales. In this latter section the leaves are usually very fleshy and firm, and the capsule is usually far extruded from the calyx. In the Section Obtusifolia the leaves are thin and membranous, with very elongated, thin petioles, and the capsule, as already mentioned, more or less equals the calyx. The name chosen by Royle is also appropriate, for the leaf apex is usually well-rounded, and not pointed as in so many of the Nivalids of the North-western Himalaya.

I have thought it worth while to have mounted on the same sheet two specimens taken from Sherriff, no. 7344, and the figure (p. 109 above) shows the two extremes in size, and at the same time the character of the fruit, the exact structure of which has been for a long time doubtful. The story may also serve to exemplify the trouble caused by inadequate type material, and the long trail of errors which have resulted from that imperfect beginning. Both Hooker and Watt, from personal experience, were well acquainted with the genus as it occurs in the Himalaya, but even their wide knowledge did not prevent them from taking a wrong turning. These recent collectings of 1939 have now solved this long-standing problem, as well as the question of what is *P. Traillii*.

ON PRIMULA ERRATICA.

By Sir WILLIAM WRIGHT SMITH.

REGINALD FARRER, while on his expedition in 1914 through the province of Kansu in Western China, found a small *Primula* which he compared with *P. farinosa* Linn., and which he believed to be *P. Loczii* Kanitz. It was introduced into cultivation from Farrer's seeds, and is still to be seen in a few gardens in this country. As a rule, it passes under the name of *P. Loczii*. The latter was collected in Kan-su as far back as 1879, in a tour under the direction of Count Béla Széchenyi, but for long it has been doubtful what the plant of Kanitz really is. In Pax's Monograph (1905), p. 81, it is attached to *P. borealis* Duby as var. *Loczii*, an allocation with which few have agreed. The somewhat exiguous material on which the species was founded has been examined at my request by Dr. Handel-Mazzetti of Vienna, and in his view the plant is no other than *P. stenocalyx* Maxim., published some ten years earlier than *P. Loczii*. *P. stenocalyx* is common in Kan-su and, moreover, the original diagnosis of *P. Loczii* is in accord with the criteria for *P. stenocalyx*. *P. Loczii* is, therefore, only a synonym of *P. stenocalyx*. Farrer collected abundant material of *P. stenocalyx*, and knew it well. He did not confuse his plant with that species, but believed it might represent the little-known *P. Loczii*. It is clear then that the name *P. Loczii* cannot be given to Farrer's plant.

Apparently from Farrer's statement (cited later) it is locally abundant, but I have seen no other material exactly similar collected from Kan-su, nor is there anything in the literature on *Primula* which is in correspondence. Purdom was associated with Farrer in its discovery, as I have a sheet from his collecting under the same number as that of Farrer. It may, however, occur beyond the province of Kan-su, for in the Kew Herbarium is a sheet under Purdom, no. 20, not quite identical in character, but certainly very near to *P. erratica*, as I am calling Farrer's plant. Purdom secured his plant at 'Wei-chang', but the province is not indicated. This is unlikely to be Chih-li, where there is a 'Wei-chang'. I incline to place it somewhere in Sze-chwan. There are also in Herb. Edinb. specimens collected by the Rev. R. Cunningham in the mountains some distance from Ta-t sien-lu which have the appearance of being dwarfed states of *P. erratica*. But so far, there is no clear evidence that typical *P. erratica* has been found outside Kan-su.

There is a reference (under *P. Loczii*) to its cultivation in the 'Quarterly Bulletin of the Alpine Garden Society', vol. III (1935), p. 46, where mention is made of its stoloniferous habit. In its resting period it is girt round the base with a rosette of

fleshy scales, which gradually disappear as growth advances. Much larger rosettes of fleshy scales are, of course, seen in *P. denticulata* Sm., and also in *P. efarinosa* Pax and *P. sertulum* Franch. These species, however, are much more robust plants than *P. erratica* of which a diagnosis is here appended :—

***Primula erratica* W. W. Sm. Sp. nov.**

Species ex affinitate *P. stenocalycis* Maxim. a qua calyce valde diverso facile separatur; inter affines sunt etiam *P. sertulum* Franch. et *P. Kunthiana* Pax.

Planta vulgo 8–10 cm. alta, basi stolones emittens, juventute ante evolutionem vernalem squamis carnosulis circumdata. *Folia* oblanceolata vel anguste obovata, ± 2.5 cm. longa, ± 1 cm. lata, apice rotundata vel obtusa, basi in petiolum brevem latiusculum vix discretum cuneatim angustata, margine argute denticulata vel raro subintegra, in sicco membranacea, glabra atque ut videtur efarinosa, nihilominus infra glandulis farinipotentibus bene munita atque ex collectore nonnunquam farinosa, costa infra conspicua eminente, venis 5–6-paribus angulo acuto abeuntibus. *Scapus* ad 10 cm. altus, umbellam 4–8-floram gerens, gracilis, flexuosus, ad apicem leviter farinosus; pedicelli 5–10 mm. longi, graciles, farinosi; bractee subuliformes, circ. 2 mm. longae, acutissimae, basi gibboso-inflatae sed haud infra productae. *Calyx* cupularis, 4–5 mm. longus, ad medium in lobos anguste lanceolatos acutos suberectos vel paulo patentes divisus, leviter farinosus. *Corollae* roseae glabrae tubus 6–8 mm. longus, e calyce bene exsertus; lobi obcordati, 5 mm. longi, alte atque late emarginati, ceterum integri; flos in sicco circ. 1 cm. latus vel paulo ultra. *Stamina* in flore longistylo calycis ad apicem attingentia, in flore brevistylo ad os corollinum vix pertinentia. *Stylus* in flore brevistylo calyce brevior, in flore longistylo vix exsertus. *Capsula* fere globosa, paulo elongata, calyce inclusa.

West China.—Province of Kan-su. Farrer no. 40, in Herb. Edinb. and Herb. Kew.

Farrer's field-note is as follows :—

'*Primula* "Loczii" (?) No. 4, replacing *P. farinosa* in similar situations, cool and open, all over the high moors and coppice banks about Ga-ho-ba, very abundant indeed in rich moorland loam; greyish and farinose in shade, bright green and perfectly glabrous and efarinose (except the bracts and pedicels) in the opener places where it usually and specially abounds. Stoloniferous. May 11 and 12, 1914. (Its perigee about 10 days earlier.)'

In his 'Eaves of the World', 1 (1917), p. 195, he adds :—
'Emerging from this wood, you pass a little cosy monastery tucked undiscoverably into a bay of the hill, and find yourself

on a moorland down of shrubby *Potentillas* and such-like leading up to the final ridge, and dimpled with myriads of tiny hummocks, round the turfy slopes of which glows everywhere the rose-pink heads of a dear little *Primula* *.

* *P. Loczii* Kanitz, as I firmly believe; the original record and diagnosis of *P. Loczii* from Kansu being in no way necessarily invalidated by Kjellman's subsequent erroneous inclusion under this name of another species from far-off Alaska.

so close akin to our own bird-e'en that you need go no farther than *P. farinosa* for its picture, though this pretty thing has no meal, is perhaps a trifle shorter in the stems and larger in the flowers, and has the very curious habit of running about with bright green fleshy runners till it often forms into an intricate mat, each rosette sending out half a dozen runners or more, with the effect of some questing vegetable octopus.'

The stoloniferous habit, rare in the genus *Primula*, is very marked in this species and is comparable to what is seen in *P. flagellaris* W. W. Sm. and *P. caldaria* W. W. Sm. & Forrest. The runners are at first, as Farrer points out, green and fleshy, but they persist throughout the winter as thin wiry threads, each with a tiny plantlet at the extremity. After the hard weather of January-March 1940, I saw plants in the open just coming into flower at the very end of March with the old runners extending for some half-dozen inches in length.

THE NESTING OF THE LEATHERY TURTLE, *DERMOCHELYS CORIACEA* (LINNÉ).

By P. E. P. DERANIYAGALA,
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SINCE very little is known about the habits of *Dermochelys coriacea* (Linné), the present article is a supplement to the account of its nesting habits already published in the 'Tetrapod Reptiles of Ceylon', 1939 †.

The main features of interest there described are the number of preliminary holes or 'false nests' it excavates before commencing the nest hole, the strong fishy odour it emits while laying, the large number of abnormal eggs it deposits, and the extraordinary efficiency with which it disguises the 'nest' site. South coast fishermen interrogated in January 1940 stated that *Dermochelys* came ashore to lay either a couple of days

† Colombo Museum Natural History Series, vol. I.

prior to or after full moon, and that it would be possible to secure photographs on those days during the ensuing month. Arrangements were accordingly made, and the beach at Kosgoda in the Southern Province was searched on the nights of February 21st to 24th inclusive. A *Dermochelys* was observed at 3 a.m. The turtle commenced laying at 4.15 a.m. and finished in about 20 minutes. The pit was then filled with sand, and the animal commenced to travel towards the sea at 5 a.m.

Flash-light photographs were secured, the process of laying being observed and photographed by removing the side of the nest hole. The following features are of interest, as some of them have not been described previously.

When the turtle had advanced half-way up the beach between the wave line and scrub undergrowth she travelled in a circle, her track suggesting that the nest was at this place. She then proceeded further inland digging several 'false nests' on the way, and throwing up a shower of sand with her fore-flippers from time to time. This sand covered her, and soon rendered her dark form inconspicuous on the moon-lit beach, while the tear-like fluid which streamed from her eyes washed the sand from them and formed a long stringy mass adhering to her face under the eye and lower jaw. After excavating the nest hole the hind flippers were placed edge to edge covering the tail, and she commenced to lay. The eggs issued in spurts of three, four or five at a time from the cloaca, which was protruded, and it was observed that the larger of the abnormal eggs, which were about half the size of the normal ones, commenced to appear before the smaller. The first appeared about half-way during the process of laying, and the smallest were the last to be deposited. Altogether 125 eggs were laid; of these 100 were normal, 5 were about half the normal size, 9 were about one-third normal size, and of these two possessed prominences, 7 were quarter-sized, and 4 were very small, and were the last to be laid. A strong fishy odour was very evident during the laying of the eggs.

She next filled up the pit and gyrated above the spot showering sand with her fore flippers to the height of the observer's hips. After continuing to do this for a distance of five or six metres in a line parallel with the water, she turned seaward and shuffled about 15 metres in this direction; she then travelled in a circle, repeating what she had done prior to laying. Eventually she reached the sea, where she paused at the water's edge, and, as the wave retreated, shuffled forward. The next wave floated her off the sand, and when she reached water sufficiently deep, submerged and swam a few strokes, then raised her head above the surface, inhaled deeply, and disappeared.

There are other features which should also be recorded. There is a general but entirely erroneous idea that *Dermochelys* bellows loudly. This is not so. The sounds produced by it are not noticeably different from those emanating from the marine Thecophora. *Dermochelys* breeds all the year round, but appears to possess two maximum periods of breeding intensity, viz., May and June, and October to December. The fishermen of Kosgoda affirm that an individual with half a fore-limb amputated by a shark's bite, and which they have nicknamed 'Ath kotta' (Short arm), appears more or less regularly on this stretch of beach at intervals of about three months. It is also noteworthy that this turtle, the most aquatically adapted member of the order, proceeds well inland before nesting, whereas many of the marine Thecophora often lay their eggs much closer to the sea.

NOTES ON SOME INDO-PACIFIC CRABS (CRUSTACEA, DECAPODA).

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(With 15 figures)

INTRODUCTION.

The following short notes and figures were prepared before the outbreak of hostilities while identifying various small acquisitions to the Crustacea Collection. I had hoped to be able to incorporate them in due course in a report on the 'John Murray' Collection. I see little prospect at present, however, of being able to work on any large collection, and think it advisable to publish these notes now in the form of a short paper.

PORTUNIDAE Dana.

CAPHYRINAE Alcock.

Genus CAPHYRA Guérin.

Nobili, 1901, Ann. Mus. Zool. Napoli, 1, no. 3, pp. 11-12. Key to the determination of the species.

Balss, 1934, Faune Colon. franç. Paris, v, fasc. 8, p. 506.

Caphyra polita (Heller).

Camptonyx politus Heller, 1861, SitzBer. Ak. Wiss. Wien, XLIII, pt. i, p. 359, pls. iii and iv, figs. 26-32.

Caphyra polita Nobili, 1906, Ann. Sci. nat. Zool. (9) iv, p. 189 (earlier references).

Material.—1 ♂, 2 ♀♀, from Ghardafa, Red Sea, collected by Dr. R. Gurney.

Remarks.—The first pleopod of the male was figured by Heller (1861, pl. iv, fig. 32), so that there can be no doubt as to the identity of these specimens with his '*Camptonyx politus*'. The pleopod ends in a characteristic wing-like expansion on the convex (or abdominal) side of which the opening is situated (fig. 1 *b*, *o*). The only other species of the



FIG. 1.—*Caphyra laevis* A. M.-Edw., *a*, first pleopod of ♂, sternal aspect, with apex more highly magnified. *Caphyra polita* (Heller). *b*, first pleopod of ♂, sternal aspect, with apex more highly magnified, $\times 22$ & 50 . The opening *o* is on the abdominal side.

genus in the British Museum collection of which male specimens are available are *C. rotundifrons* (A. M.-Edw.) from Samoa, and *C. laevis* A. M.-Edw. from Australian waters. The first pleopod of each species is represented in figs. 2 *b*, 1 *a* and 2 *a* respectively, for comparison with that of *C. polita*.

As stated by A. Milne-Edwards (1873, *Nouv. Arch. Mus. Paris*, ix, p. 173), there are 3–6 acute teeth along the lower border of the merus of the cheliped in addition to the 5–6 on the anterior margin. Both series, which are omitted in Heller's figure (1861, pl. iii, fig. 27), are, as a rule, continued on to the ischium.

The fourth walking-leg (peraeopod V) appears to differ considerably, especially as regards the shape and relative length of the dactylus, in the genus *Caphyra* (cf. fig. 3 *a–c*). In *C. rotundifrons* the dactylus is rather longer than the propodus (1.2 : 1) and very slender, the length being at least eight times the basal width. In *C. polita* the dactylus is rather shorter than the propodus (1 : 1.17) and broader, the length being four times the maximum width. In *C. laevis* the

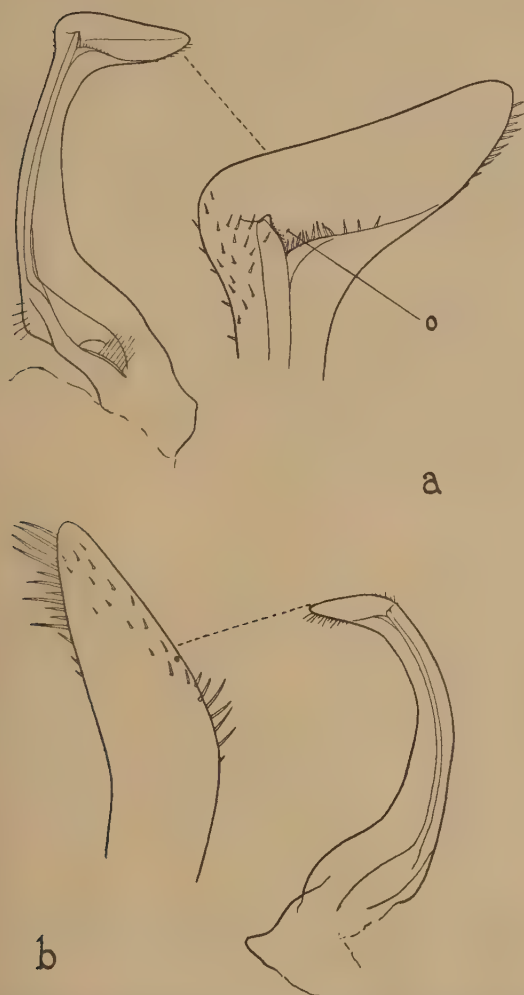


FIG. 2.—*Caphyra laevis* A. M.-Edw. *a*, first pleopod of ♂, abdominal aspect, with apex more highly magnified. *o*, opening. *Caphyra rotundifrons* (A. M.-Edw.). *b*, first pleopod of ♂, sternal aspect, with apex more highly magnified, $\times 27$ & 60 .

dactylus is also rather shorter than the propodus (1:1.11) and is expanded throughout most of its length, thus tending to approach that of the more typical Portunidae.

Caphyra laevis (A. Milne-Edwards).

Goniosoma laeve A. M.-Edwards, 1869, Nouv. Arch. Mus. Paris, v, p. 152.

Caphyra laevis A. M.-Edwards, 1873, Nouv. Arch. Mus. Paris, ix, p. 173.

? *Caphyra laevis* De Man, 1888, Arch. Naturg. Berlin, LIII, p. 337 (*C. semigranosa* suggested on p. 338).

C. laevis & *C. semigranosa* Nobili, 1901, p. 12 (in key).

Material.—

(a) 1 ♂, 6 ovig. ♀♀, from polyps of *Xenia*, Batt Reef, North I.; 2 ♂♂, 1 ♀, from polyps of *Xenia*, Low Isles. Great Barrier Reef Exp.

(b) 3 ♂♂, 7 ♀♀ (2 ovig.), from Masthead Id., Queensland. Reg. no. 1912.11.22.68-75.

(c) 1 ♀, from Amboina on *Xenia elongata*.

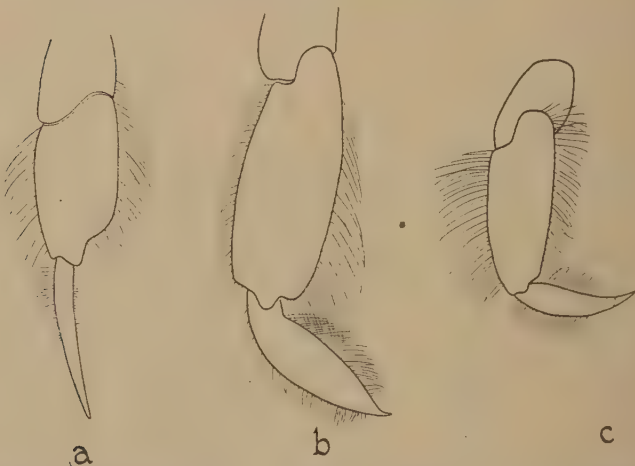


FIG. 3.—Distal segments of fourth walking-leg of:—a, *Caphyra rotundifrons* (A. M.-Edw.), $\times 8$. b, *Caphyra laevis* A. M.-Edw., $\times 8$. c, *Caphyra polita* (Heller), $\times 14$.

Remarks.—Several of these specimens have minute granulations on the anterior half of the carapace, and agree with de Man's description of ? *Caphyra laevis*. In one specimen from Masthead Island the fourth antero-lateral tooth is absent on the left, and vestigial on the right, side of the carapace. As a rule, however, all five teeth are present;

the first three are each larger than either of the following two, and the penultimate one is smallest. The distal part of the fourth walking-leg is represented in fig. 3 b.

Milne-Edwards (1869, p. 152) stated that the type-specimen possessed six antero-lateral teeth; as regards the second specimen he wrote (1873, p. 172), 'les bords latéraux étaient découpés d'un côté en cinq dents, et de l'autre en présentaient six, la cinquième plus petite que les autres'; his figure, however, shows five on each side (pl. iv, fig. 2). As far as one can judge from his figures, the dactylus of the fourth walking-leg is relatively shorter and narrower than in the specimens that I have examined, but the figure may not be quite accurate. It seemed most desirable to re-examine Milne-Edwards's specimens, and I wrote to the authorities of the Paris Museum to ascertain whether they were still extant. Monsieur Marc André replied that he had been unable to trace them.

It seems probable that *Caphyra laevis* is a rather variable species, both as regards the number of antero-lateral teeth and the presence or absence of minute granules on the carapace. Granules appear to be characteristic of the smaller, rather than of the larger, specimens. There does not seem to be sufficient grounds for separating *C. semigranosa* from *C. laevis*.

XANTHIDAE Alcock.

Lachnopus tahitensis de Man.

Xantho (*Lachnopus*) *tahitensis* de Man, 1889, Zool. Jahrb. Syst. iv, p. 418, pl. ix, figs. 4, 4 a.

Lachnopus tahitensis Ortmann, 1893, Zool. Jahrb. Syst. vii, p. 452.

Lachnopus tahitensis Balss, 1938, Göteborg, Vet. Handl. B, v, no. 7, p. 36.

Material.—1 ♂ (*c.l.*=21.8 mm.; *c.b.*=35 mm.); 1 ♀ (*c.b.* approx. 42 mm., unfortunately the specimen has been cut round the lateral margins of the carapace); 1 ♀ (*c.b.* approx. 43 mm., the carapace, which is rather soft, is also damaged somewhat on one side); all from Samoa (Buxton Coll.).

DESCRIPTION OF THE YOUNG MALE.

The carapace is distinctly convex antero-posteriorly and slightly so from side to side. The dorsal surface is finely punctate to the unaided eye, the pits fading out laterally and posteriorly; under magnification the anterior part is seen to be closely beset with minute granules. The lobulation is very similar to that figured in the larger holotype by de Man (1889, pl. ix, fig. 4), and is very faint. There is a sharp tooth at the junction of the antero- and postero-lateral margins, which are subequal. In front of this tooth are three wide cristate lobes, each rather longer than the one behind it;

the anterior lobe fades out a short distance from the orbital border. At the external angle the orbital margin is subdivided into three distinct lobules, the ventral one of which is keeled, and there is a larger more prominent lobe at the inferior inner angle. The antenna stands in the orbital hiatus (fig. 4).

The fronto-orbital border is considerably less than half the width of the carapace; the median frontal lobes are wide and convex, the small external lobes are separated from the superior inner orbital angles by a V-shaped notch.

There is a median longitudinal furrow on the ischium, and a depression on the inner half of the merus, of the third maxilliped.

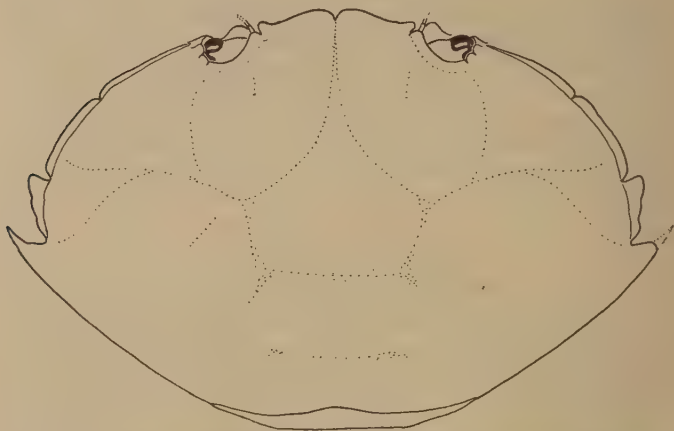


FIG. 4.—*Lachnopus tahitensis* de Man, ♂, Carapace in dorsal aspect, $\times 2.7$.

Segments 3–5 of the abdomen are fused; segment 7 is triangular, with a bluntly rounded apex, is as long as its proximal width and considerably longer than the preceding segment.

The chelipeds are slightly unequal. The upper border of the merus is armed with six minute spinules and there are two blunt lobules, the upper much broader than the lower one, at the inner angle of the carpus. The chela is smooth, with a faint indication of a median longitudinal ridge, and a longitudinal shallow furrow near the upper margin. The smaller chela, especially, is pitted. The width of the larger chela is almost equal to, and the dactylus is about five-sixths of, the dorsal border of the palm.

The walking-legs are very similar to those of the holotype (de Man, 1889, pl. ix, fig. 4), but there are, in addition to a spine at the carpo-propodal articulation, 3-5 spines on the upper border of the carpus and 2 on the propodus of the third leg. There is also a row of spines on each merus.



FIG. 5.—*Lachnopus tahitensis* de Man. ♂, *a*, first pleopod, $\times 12$, with apex, $\times 46$. *b*, second pleopod, $\times 20$.

The pleopods of the male specimen are as represented in fig. 5 *a*, *b*.

Remarks.—The lobulation of the antero-lateral margin in the soft female is very similar to that of the male, though a trifle

less pronounced. The median frontal lobes, on the other hand, are more advanced, and are separated medially by a wider and deeper V-shaped notch. The chelipeds are also very similar to those of the male, but the lobules on the cutting edge of each finger are more numerous and more clearly defined*.

The lobulation of the antero-lateral margin of de Man's holotype is much less pronounced; the specimen is probably rather worn, since it is considerably larger than the Samoa material (c.b., 54 mm.). The male specimen was sent to Dr. H. Balss of Munich, and he is of the opinion that it must be a rather young specimen of *L. takitensis* (letter dated 8. ii. 39).

Etisus australis (Ward).

Etisodes australis Ward, 1936, Mem. Queensland Mus. xi, pt. i, p. 5, pl. ii, figs. 4, 5, 6.

Etisodes frontalis Calman, 1900, Trans. Linn. Soc. London (2), Zool. viii, pt. i, p. 7.

Etisus calmani Odhner, 1925, Göteborgs Vetensk. Handl. xxxix, 1, p. 84, n.n.

Material.—2 ♂♂, from Fringing Reef, Mabuiag Torres Straits—pres. by the Dundee Museum accompanied by a label '*Etisus calmani* n. sp. Type! det. T. Odhner'; 2 ♂♂ from Thursday Island. 'Alert' Colln. reg. no. 82.7, accompanied by a label '*Etisus calmani* Odhner; det. T. Odhner 1924'.

In 1900 Calman referred the two specimens from Mabuiag to *Etisodes frontalis* Dana, but his short note, which can scarcely be regarded as a description, shows that the specimens are more nearly related to the *E. frontalis* of de Man† than to Dana's material. Odhner re-examined these two specimens and, recognizing that they were distinct from *E. frontalis* Dana and the *E. frontalis* of de Man†, made them the types of a new species *Etisus calmani*. This name appeared, without description, in 1925 and, as the specimens are now in the British Museum collection, I thought it advisable to publish a description. They prove, however, to belong to *Etisodes australis* Ward, four paratypes of which, 3 ♂♂, 1 ♀, were presented to the British Museum. Odhner's *Etisus calmani* may be regarded as a *nomen nudum*, and Ward's specific name must be employed. As Ward's description is rather short, without any discussion of relationships, I give here some notes and figures to supplement his account.

* There are 4 lobules on each immovable finger, 4 and 6 on each dactylus in the ♀; 2 and 4 on each immovable finger, 2 and 3 on each dactylus in the ♂.

† Now *Etisus demani* Odhner, see p. 135.

Description.—The carapace is half as long again as wide, the greatest width being on a level with the penultimate lobe of the antero-lateral margin. The areolation is as represented

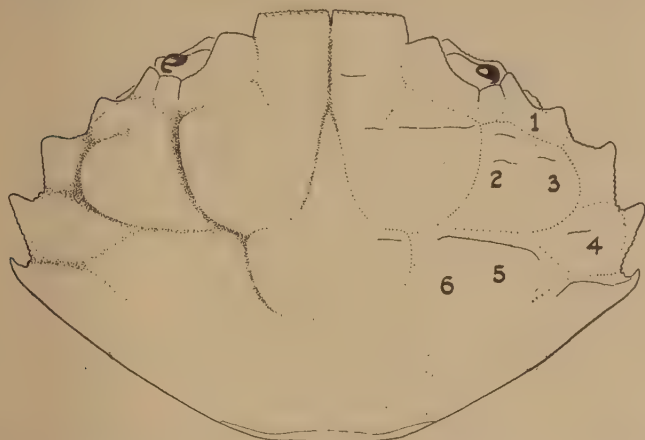


FIG. 6.—*Etisus australis* (Ward). Carapace of smaller type of '*Etisus calmani* Odhner', dorsal aspect.

1-6, lobules 1L-6L (*c.l.* = 11, *c.b.* = 16.4 mm.).

in fig. 6; lobes 2L and 3L are confluent; 5L and 6L are also confluent and merge into 2R and 3R posteriorly*. The faint granulated ridges present on the anterior two-thirds of the carapace are represented on the right half of the figure by fine lines.

The antero-lateral lobes are four in number, excluding the external orbital angle; the second and third are most prominent, and the fourth is tipped with a strongly curved spine.

The front projects considerably beyond the internal orbital angles; it is divided into two truncated lobes separated by a very narrow median fissure; the anterior margin of each lobe is finely granulated, and there is little, if any, trace of subdivision into an external and an internal lobule.

The chelipeds are unequal in both sexes, and the fingers are hollowed and somewhat hoof-shaped at the tips. The smaller chela differs appreciably from the larger in shape as well as in size; the fingers are longer, less curved distally, and are armed with more numerous but finer teeth (fig. 7 *a* & *b*).

* See Dana's figure reproduced in Rathbun, 1930, Bull. 152, U.S. Nat. Mus. p. 6, fig. 3, for terminology of lobules in Xanthids.

In younger specimens the fingers of the smaller chela meet along their entire length, in older specimens they meet at the tip only, leaving a narrow fissure, and the lower border of the chela is distinctly concave. The upper border of the palm consists of two low parallel ridges each of which has 2-3 low,

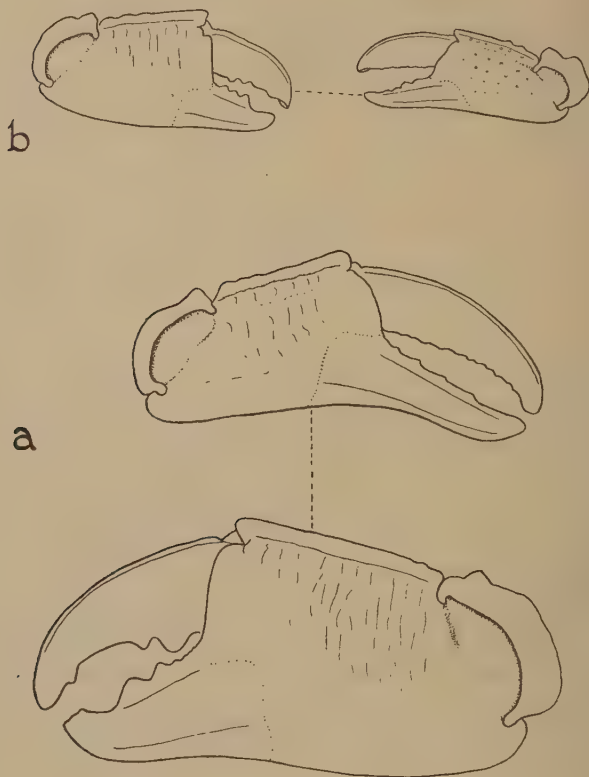


FIG. 7.—*Etisus australis* (Ward). *a*, right and left chelae of the larger type of '*Etisus calmani* Odhner' (*c.b.*=17.2 mm.). *b*, right and left chelae of smaller ♂ from Thursday Island (*c.b.*=11.8 mm.). All $\times 5$.

rounded lobules proximally; these ridges are much worn in older specimens, especially on the larger chela.

The walking-legs, one of which is represented in fig. 10 *a*, are fringed with long brownish-yellow hairs. The low granules on the upper margin of the merus and the carpus are more

pronounced in older individuals, as also are the spines on the propodus and the dactylus (cf. figs. 8 c, 10 a, & 10 b, c). The dactylus is nearly twice as long as the upper border of the

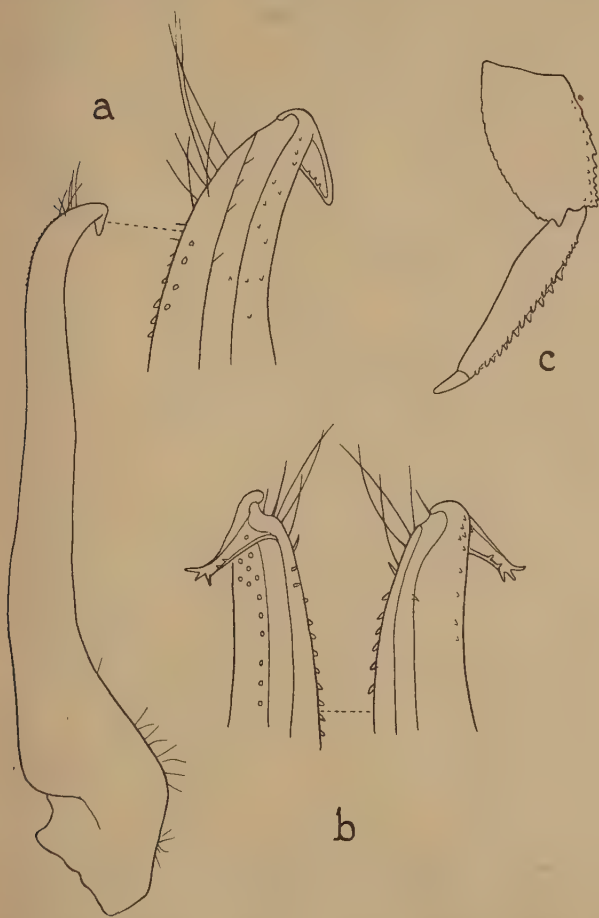


FIG. 8.—*Etisus australis* (Ward). a, first pleopod of larger type of '*Etisus calmani* Odhner', from sternal aspect, with apex more highly magnified, $\times 20$ & 60. b, apex of first pleopod of smaller ♂ from Thursday Island, $\times 60$. c, distal segments of first walking-leg of small ♂ from Thursday Island, $\times 11$.

propodus, and there is a conspicuous conical projection on the inner margin, near the claw, of the third and fourth legs.

The first pleopod of the male is represented in fig. 8 a & b.

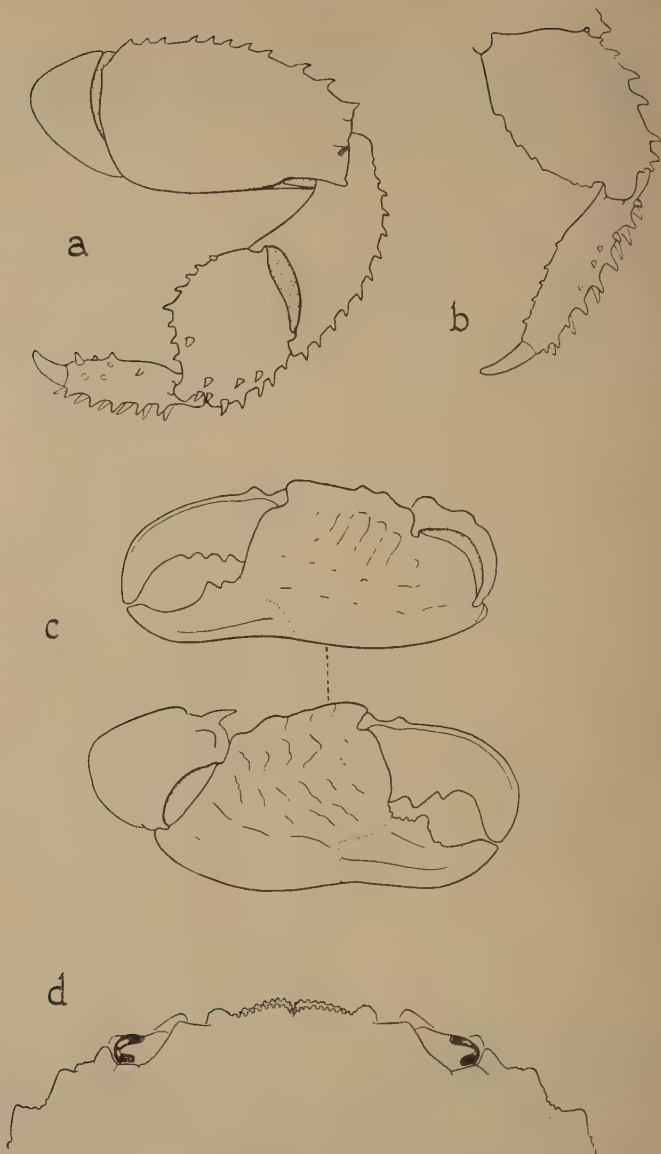


FIG. 9.—*Etisus demani* Odhner, smaller cotype (c.l.=9·7, c.b.=14·2 mm.),
 a, fourth walking-leg, ×10. b, distal segments of first walking-leg,
 ×10. c, right and left chelae, ×6. d, anterior portion of
 carapace, ×6.

Remarks.—This species is closely allied to *Etisus demani* Ohdner (1925, p. 84—this is a new name for *Etisus frontalis* de Man, 1891, Notes Leyden Museum, XIII, p. 8, pl. i, fig. 2, 2a). The smaller cotype, which I have received on loan from the Leiden Museum, differs from *E. australis* in the following respects:—

1. The front is less prominent, and each half is divided

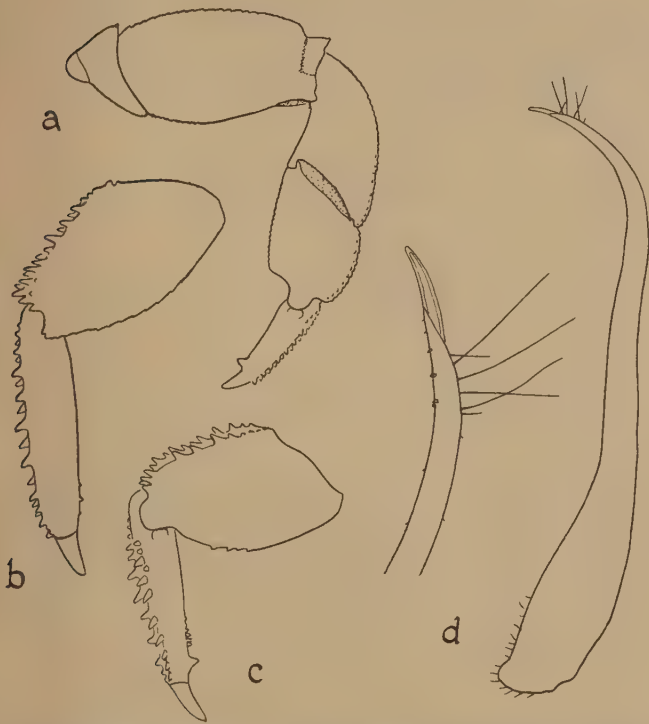


FIG. 10.—*Etisus australis* (Ward). *a*, fourth walking-leg of small ♂ from Thursday Island. *b*, distal segments of first or second walking-leg of larger ♂. *c*, distal segments of third walking-leg of same. All $\times 9$. *E. demani* Ohdner. *d*, first pleopod, sternal aspect, $\times 17$ & 50.

into a short rounded outer, and a longer slightly convex inner, lobule (fig. 9 *d*). In de Man's figure, which is doubtless of the larger cotype, the front is not unlike that of *E. australis*, except that the separation into outer and inner lobules is more pronounced.

2. The areolation of the carapace differs in that lobes 2L and 3L are separated as are 5L and 6L; 1R, 2R and 3R are also more distinct.

3. The chelae have the fingers much more abruptly curved distally leaving a wider gap between them. The smaller chela is more like the larger in general shape, although the fingers are a trifle longer (cf. figs. 9 c & 7).

4. The walking-legs are more spinose; the upper margin of the merus is armed with spines instead of granules; the propodus of the fourth leg is considerably broader than long (cf. figs. 9 a, b & 10 a-c, 8 c).

5. The first pleopod is more slender and sinuous and the apex is not bent abruptly backwards (cf. figs. 10 d & 8 a).

OCYPODIDAE Ortmann.

SCOPIMERINAE Kemp.

Genus DOTILLA Stimpson.

Kemp, 1919, Rec. Ind. Mus. Calcutta, xvi, pt. v, pp. 324-6.

Dotilla fenestrata Hilgendorf.

Kemp, 1919, p. 326 (in key), p. 327, for references and synonymy.
Balss, 1934, Faun Colon. franç. Paris, v, fasc. 8, p. 521.

Material.—See list below.

Remarks.—Balss has commented on the variations exhibited by this species. All the specimens in the British Museum collection possess the strong spine on the merus of the cheliped, which is absent in specimens from Madagascar. There is, however, much variation in the number and arrangement of the tympana on the thoracic sternal plates as shown in the following list :—

Register no.	Locality.	No. of specimens.	Position of tympana.
1928.12.1.152*	Durban.	2 ♂♂	on segments 2 and 3
1913.2.14.8-10	Durban.	2 ♂♂	„ segment 2
		1 ♂	„ segments 2 and 3
1917.6.19.53 ...	Natal.	1 ♂	„ „ 2 and 3
1910.12.16.24 ..	Mombasa.	1 ♂	„ „ 2 and 3
		3 ♂♂	„ „ 2 and 3
1910.82.24.	Mozambique.	3 ♂♂	„ „ 2, 3 and 4
		5 ♂♂	„ „ 1, 2, 3 and 4

* Cotypes of *D. clepsydra* Stebbing.

The specimens from Mozambique differ from the others in having, as a rule, additional tympana on segment 1 or 4 or both; in some individuals a trace of one, or both, of these may be present on one side and not as yet on the other. Specimens from other localities usually have tympana on segments 2 and 3, occasionally on segment 2 only.

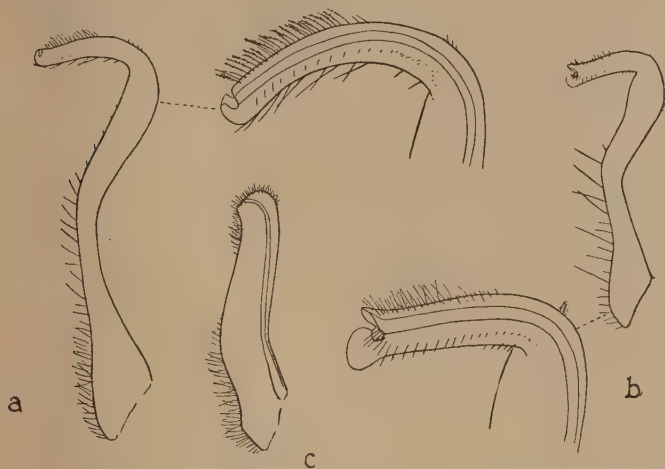


FIG. 11.—First ♂ pleopod of:—*a*, *Dotilla fenestrata* Hilg., $\times 15$ & 45. *b*, *Dotilla sulcata* (Forsk.), $\times 15$ & 45. *c*, *Dotilla intermedia* de Man, 'high' form, $\times 15$.

The first pleopod of the male, represented in fig. 11 *a*, most nearly resembles that of *D. sulcata*.

Dotilla malabarica Nobili.

Nobili, 1903, Bull. Mus. Torino, xviii, no. 452, p. 20, fig. 6.

Material.—1907.2.7.12–14, Travancore, 2 ♂♂, 1 ♀. 1910.9.30.4–8, Travancore, 4 ♂♂, 2 ovig. ♀♀.

Remarks.—These specimens differ from Kemp's detailed description of *D. pertinax* (1915, Mem. Ind. Mus. v, p. 222; pl. xii, fig. 4, and text-fig. 7) in the following respects:—(1) The grooves on the dorsal surface of the carapace are deeper, the areolae are more pronounced and more numerous on the mesogastric region, and there is no transverse groove parallel to the posterior margin. (2) The two grooves on the outer half of the merus of the external (third) maxilliped are confluent anteriorly; in *D. pertinax* the outer arches over the inner groove and is then continued backwards for some distance (Kemp, 1915, p. 223, fig. 7 *a*). (3) The eye-stalk is more robust (cf. figs. 12 *a*, *b*). (4) In the male, the



FIG. 12.—Eye and upper orbital border of :—*a*, *Dotilla pertinax* Kemp Cotype. *b*, *Dotilla malabarica* Nobili, $\times 15$.

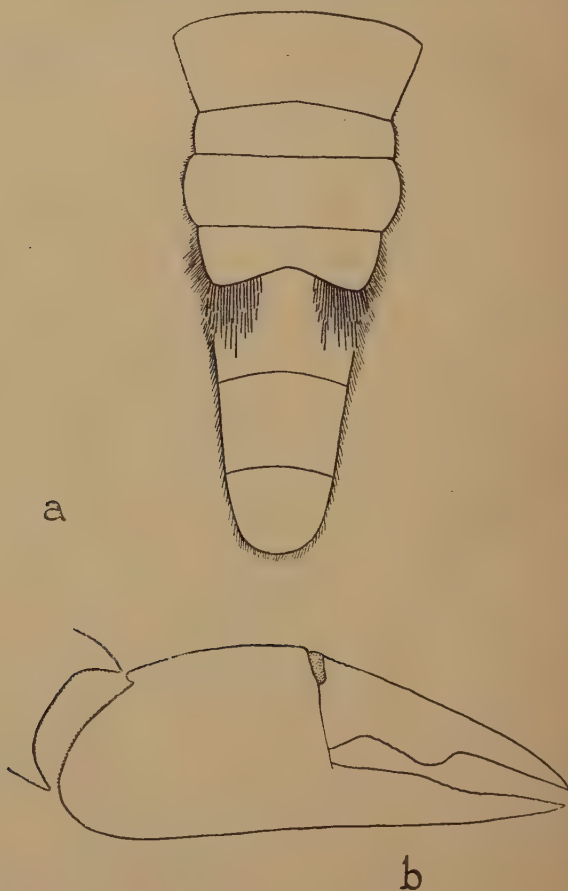


FIG. 13.—*Dotilla malabarica* Nobili. *a*, abdomen of σ , $\times 9$. *b*, chela of σ , $\times 11$.

ratio of length of dactylus to length of palm is 1.3–1.6 : 1 as against 2 : 1 in *D. pertinax*; in the female it is 2.25 : 1 as against 3 : 1. (5) The dactylus of the fourth walking leg is at least twice as long as the propodus; in adults of *D. pertinax* the ratio is 1.33 : 1 (see Kemp, 1915, p. 224). (6) The penultimate abdominal segment of the male is narrower (ratio of length to breadth 1.33 : 1 as against 1.85 : 1 in *D. pertinax*, see fig. 13 a).

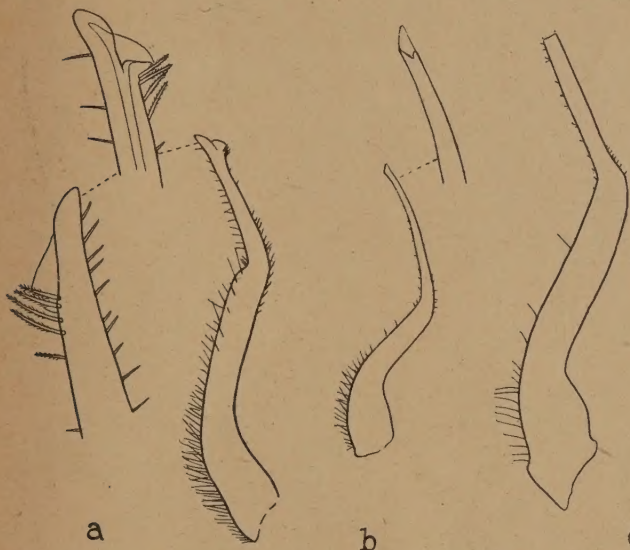


FIG. 14.—First ♂ pleopod of:—a, *Dotilla malabarica* Nobili, $\times 15$ & 45. b, *Dotilla pertinax* Kemp, young cotype, $\times 15$ & 45. c, *Dotilla pertinax* Kemp, adult (apex missing), $\times 20$.

As a rule, a tympanum is absent from the upper surface of the merus of the fifth peraeopod (last walking-leg); in one male specimen, and that not the largest, there is a trace of a tympanum.

As far as one can judge from Nobili's very small photographs, the sculpturing on the dorsal surface of these specimens from Travancore agrees extremely well with that of *D. malabarica*. The larger males, however, have a conspicuous broad tooth on the dactylus of the chela, as represented in fig. 13 b.

The first pleopod of the male, represented in fig. 14 a, most closely resembles that of *D. pertinax* (fig. 14 b, c); unfortunately, in the only available adult male of the latter species, each pleopod appears to be damaged at the apex. In this form of pleopod the distal third is more slender than,

and bent at an angle of about $40-45^{\circ}$ to, the main shaft. As already mentioned, there is also a very close resemblance between the pleopods of *D. fenestrata* and *D. sulcata* (figs. 11 *a*, *b*); in each the pleopod is very sinuous, and the distal fourth is bent abruptly at an angle of about 90° to the main shaft. In the remaining species examined the pleopod



FIG. 15.—First ♂ pleopod of:—*a*, *Dotilla wichmanni* de Man.
b, *Dotilla myctiroides* (Milne-Edwards), $\times 17$ & 40 .

is robust, very slightly sinuous, of almost uniform diameter throughout or rather more slender in the distal two-thirds (*D. wichmanni*, fig. 15 *a*; *D. myctiroides*, fig. 15 *b*; and *D. intermedia* 'high' form, fig. 11 *c*). Kemp (1919, p. 331, fig. 10) found dimorphic males in *D. intermedia* and figured the first pleopod of each form. The pleopod of the 'low' male is longer and more slender than in the 'high' form, is rather sinuous proximally, and the apex is bent abruptly at right angles to the main shaft, so that it somewhat approaches the *fenestrata-sulcata* form.

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